Chemical Age

CHEMICAL ADDITIVES IN FOOD (page 171)

VOL. 78 No. 1986

2 August 1957

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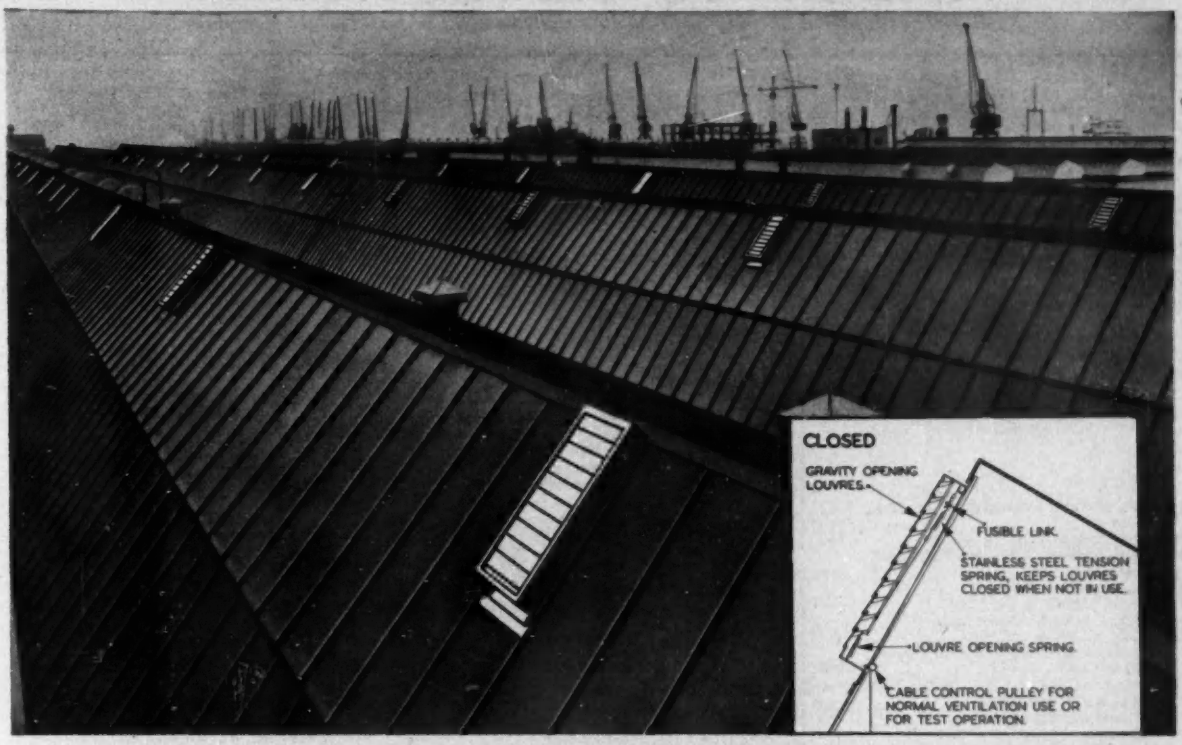

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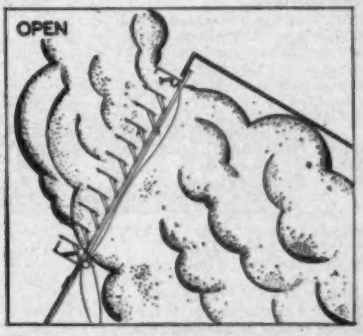

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CHEMICAL AGE

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FOOD ADDITIVES

NOW being studied in many countries is the use of chemical additives, particularly with regard to what legislation or restrictions are essential in the public interest. Hence the interest aroused last week by the joint meeting held at the Royal Institution, London, between the Food Law Institute of the US, the Food Group of the Society of Chemical Industry, the Society for Analytical Chemistry and the Association of Public Analysts.

Details of the papers which were presented by food and drug authorities of the UK, Canada and the US can be studied in this issue (p. 171), as can the comments made and the discussion which followed the reading of these most informative papers.

The subject of the use of chemicals in foods is undoubtedly most suitable for discussion on an international basis having regard to the great world trade in foods both processed and raw. Prevention of wastage during growth and storage of food, both animal and vegetable, throughout the world is of vital importance in these days of ever-increasing populations. Indeed, prevention of wastage due to bacterial, fungal or other predatory attacks, would allow the world 10 per cent more food.

Food and drug authorities in this country, the Commonwealth and the US are fully aware of the benefits that can result from the skilled use of chemical additives in foods. They are also fully conversant with the risks that the use of additives might mean. It can be said, however, that the major countries of the world exercise a very close control of the use of additives as witnessed by a country's 'permitted list' of food colours, flavouring agents, antioxidants, emulsifiers, processing aids, antibiotics or pesticides—these being the main types of preparations associated with the food industry.

It is only recently, though, that the public has been conscious of changes in the methods of food production, processing and marketing, which involve a greater use of an ever-growing number of chemical substances. This is undoubtedly due to the publicity given to food additives, and in particular, to the antibiotics as additives. And it is the public in the US and Canada that have been especially anxious about the safety of their food supply under the present circumstances. Associated in the public mind is, of course, the idea that chemicals in foods are used mainly to swell the profits of food and chemical manufacturers.

The public has every right to demand assurances that the Government does provide the necessary protection against possible health hazards from food additives. Therefore, governmental and medical authorities, it is suggested, should permit food additives only after thorough investigation. The lines along which such investigation should proceed were clearly indicated at the London conference. These were that it should be demonstrated that the proposed use of an additive produced a definite improvement in food production, storage or palatability. Another criterion was that the quantities of chemical additives present or persisting in food when eaten should be harmless no matter how much food might be taken. A further important need was that there should be suitable and practical analytical procedures for measuring, as accurately as possible, the residues or amounts of additives likely to be present in foods. Rational methods of dealing with chemical additives involve the setting of tolerances, that is, the

maximum amounts of possibly harmful substances that are permitted by law in or on foods intended for human consumption.

That there have been few outbreaks of acute illness that can be traced to chemical additives in recent years speaks well for governmental control on additives, the careful use of these by the food industry and the precise evaluation by the chemist who develops the compounds.

It was noteworthy at the recent conference that while the morning session was devoted to the control of chemical additives in food, other than antibiotics, the afternoon session was particularly concerned with antibiotics as preservatives for foods. The proposal to use antibiotics for this purpose has aroused more widespread interest and controversy than any other technical food developments. Their main use has been, and still is, in the prophylaxis or treatment of serious diseases. Therefore, the employment of antibiotics in foods should be limited to essential uses, to ensure that their value and use as therapeutic agents is not lessened or made dangerous.

Views expressed at the conference by the authors of the various papers clearly indicate that considerable thought is being given to the wisdom of employing antibiotics as preservatives. To date, only in the US has approval been granted for the use of one antibiotic—chlortetracycline—in the preservation of raw poultry, and that government has before it now for consideration the use of chlortetracycline and oxytetracycline in fish as a means of extending 'shelf life'. In Canada an enquiry was undertaken with particular reference to the tetracyclines, and Dr. Thatcher and Dr. Morrell in their paper condense much of the vast literature studied on this topic.

The position with regard to the use of antibiotics as preservatives is outlined for Great Britain in Mr. Bacharach's paper. At the present time, there is no permission to use any antibiotic as a preservative food additive in the UK, but it is understood that the use of antibiotics in meat and fish preservation and the use of antibiotics for the protection of fruit crops are being studied by the Medical Research Council and appropriate Government departments.

It is believed that the lack of discussion on the value of antibiotics as preservatives following the afternoon session at the conference disappointed many. Is there, as is thought by some, very little precise knowledge, on the part of British chemists, about antibiotics other than that antibiotics give rise to sensitivity in some persons or produce resistant organisms during medical treatment? Are antibiotics as food preservatives being widely investigated throughout Great Britain, or is investigation being confined to the MRC and those companies which produce antibiotics? What in fact is the food industry doing on the question of antibiotics?

It had been hoped that answers to these questions might have been given at the conference. Mr. Bacharach in his paper admitted that there seemed to be serious gaps in our knowledge and he suggested that useful knowledge and 'added confidence' would be provided if there were quantitative experimental results as data on which to base realistic limits of tolerance for antibiotic additives and residues in our food.

The growing use of chemical additives in foods has meant more chemical and analytical investigation with no mean role to be played by the chemist, and in particular by the biochemist and pharmacologist in testing toxicities. Even greater demands on testing facilities will be demanded in the future. Can British chemists in the food industry and in Government departments match the demands?

One of the British spokesmen, Dr. E. J. Miller, at the conference, said that hitherto in this country it was felt that not enough was known about the accuracy and reliability of methods of residue analysis to be able to recommend tolerance levels for residues in foodstuffs. The problem was being attacked at the Government Chemist's laboratory by a small team of scientists. Until residue levels are fixed, the UK is trying to achieve enforcement by advising restrictive conditions on the use of pesticides. It is interesting to note that an American journal, describing the voluntary Crop Protection Products Approval Scheme in this country, stated that 'only in Great Britain could such a scheme work'.

Reference was made by Mr. Charles Wesley Dunn, one of the chairmen at the conference, to the Congressional enquiry at present being held in the US. He suggested that an Act controlling food additives may be enforced in the US by next year. In previous Congresses, food additives Bills have been introduced and hearings held, but no new legislation resulted, due to industry and the food and drug administration not being able to agree on a compromise Bill. Both agree that chemical additives in foods should be controlled but there is disagreement as to how this should be accomplished. This time, from Mr. Dunn's remarks, the approach is different, that is, the scientific problems are to be separated from the legal and administrative problems.

No doubt the UK and Commonwealth countries, such as Canada, will be keenly watching the outcome of this latest Congress hearing. The London conference, it is considered, has played an important part in airing problems associated with legislative measures, analysis and the use of antibiotics, and undoubtedly the US Congress will be informed about the proceedings. Hopes were expressed that other such conferences should follow at suitable intervals, with which hopes CHEMICAL AGE wholeheartedly concurs.

PERIOD OF 'PROFITLESS PROSPERITY'

FOR most of this year, the annual reports of chemical concerns have shown that the industry is in the throes of a period of 'profitless prosperity'. The benefits of higher sales at home and abroad are constantly being offset by production costs that forever spiral upwards.

Latest warnings on rising costs and their effect on profit margins come from Mr. F. J. Pentecost, chairman of A. Boake Roberts (see 'Commercial News' last week) and Sir John Hanbury-Williams, chairman of Courtaulds Ltd. Sir John reported the now familiar path of rising turnover (in the first three months of 1956–57) being accompanied by rises in production costs. As a result, profits have fallen off.

The recent rise in the price of coal alone is likely to cost Courtaulds about £250,000 during the current year. This coal increase has already set off a chain reaction and higher freight charges will also affect the prices of the company's raw materials. The price of steel rose on 29 July (stainless-steel billets by £17 a ton) and the cost of electricity and gas has also followed the upward price of coal.

Higher wages and in many cases higher rates add to the burden of mounting overheads.

There is little harm in a measure of inflation, provided it is kept in close control; the present danger is that inflation is liable to get out of hand and if it does it is likely to be as disastrous to British industry as a prolonged period of severe deflation. It is no use Whitehall calling on industry to apply the brakes; the lead must come from those two prodigious spenders of public money, Government departments and the State industries.

CHEMICAL ADDITIVES IN FOOD

US, Canadian and UK Papers Given at London Conference

'TRULY an international conference' was the description given by Mr. Charles Wesley Dunn, president of the Food Law Institute of the US, and chairman of the morning session of the conference on Control of Chemical Additives in Food, held at the Royal Institution, London, on Friday, 26 July and attended by 390 people who included US food lawyers, British food technologists and public analysts.

The conference was arranged by Food Law Institute of the US, the Food Group of the Society of Chemical Industry, the Society for Analytical Chemistry, and the Association of Public Analysts of Great Britain and papers were presented by authorities from Great Britain, Canada and the US.

Opening the conference, Mr. J. B. Godber, Joint Parliamentary Secretary for the Ministry of Agriculture, Fisheries and Food, welcomed the close international co-operation between scientists and administrators to ensure that so far as possible new techniques in food production and processing could be used for the benefit of consumers without risk to health.

The Ministry's agricultural and food responsibilities made the subject a vital one to the Ministry; in both cases the paramount consideration was that the interests of the consumer be safeguarded—he must be protected from hazards to health and from the risk of deception. That was the basis of their joint work with the Ministry of Health and the Department of Health for Scotland. He was glad to say they were making progress.

World-Wide Interest

Mr Dunn said the conference was of interest for two reasons. First, the US Bar Association meeting being held simultaneously in London was discussing legal problems associated with food. It was timely, therefore, that the US should join in this conference. Secondly, the problem of chemical additives was most important and of world-wide interest. Germany was at this moment discussing this legal subject of such vital importance to the public consumer. Food additives meant all colours, all flavours, anything used to improve colourability, palatability, etc. By control of food, he meant a true test.

Mr. Dunn informed the conference that US Congress on 15 July began a series of hearings to develop amendments to the US Food and Drug and Cosmetic Act to regulate chemical additives in foods. This, he stated, would surely be enacted in 1958. It should be a precedent in legislation in the US and also of affiliated nations. It had been his privilege to make the first speech at the Congress meeting on 15 July, and he had informed Congress of this London conference.

He stressed the tremendous interest in the US at the present time regarding food additives. At the moment, besides the more political aspects 'there was nothing more important than this amendment of the Pure Food Law'. The London conference proceedings would be published in full in the Food Drug Law Journal of the US.

The new Bill on the FDC Act would regulate chemical additives in foods. The name of this particular Bill when passed would, he believed, be changed in due course. The amendments which were being considered were as follows: All food additives which required pre-testing should be pre-tested. Pre-testing and all related data should be filed with the Food and Drug Administration of the US Department of Health, Education and Welfare, and that the FDA should evaluate this pre-testing in a prescribed period under the conditions of its intended use. Then the US Government should issue a regulation which should be subjected to a three-fold review: (1) Scientific review. (2) Administrative review for consideration of arguments, data, etc., before an impartial hearing. (3) Judicial review to determine validity of the regulations.

It was hoped that by this means there would thus be proper government control.

Introducing the first speaker Mr. John L. Harvey, Mr. Dunn said that Mr. G. P. Larrick who was the co-author of the first paper had been detained in the US to give evidence before the Congress committee. Mr. Harvey, the Deputy Commissioner, of the US Department of Health, Education and Welfare, Food and Drug Administration, had been deputed to read Mr. Larrick's and Dr. Lehman's paper.

Procedure Suggested for Use of New Chemical Additives

THAT there was world-wide awareness of the need for new procedures to regulate the increasing use of new chemicals as food preservatives was emphasised by the fact that this joint meeting had attracted representatives from a number of countries. This was stated by Dr. George P. Larrick, commissioner, and Dr. Arnold J. Lehman, director, both of the division of pharmacology, Food and Drug Administration, US Department of Health, Education and Welfare, in their paper on 'Chemical food additives'.

Reasons for the need of chemical additives in food were self-evident. In the US, however, with some 22 million women being employed outside the home, there was a growing demand for convenience foods which would not have been possible without chemical additives.

Discussing the growth of legislative measures in the US on chemical additives in foods the authors said that in 1900 such additives were a hazard to public health since poisonous preservatives and colouring materials were employed. In 1906 the first US food and drug law was enacted. This stated that food would be adulterated if it contained any added poisonous or other deleterious ingredient which might render such article injurious to health. However, under this law it would have been legal for a food to have contained an amount of poison which alone did not make a food harmful, but if taken in association with other food items containing similar amounts, would prove injurious to the consumer.

The Federal Food, Drug and Cosmetic Act, passed in 1938, attempted to remedy

Before the meeting opened, Dr. J. H. Hamence, SAC president (left) with Dr. A. J. Amos, conference hon. secretary (centre) and Charles Wesley Dunn, president Food Law Institute.

L. to r. A. L. Bacharach, chairman of the Sous-Commission on Antibiotics in Foods, Dr. J. M. Ross, Ministry of Health, Dr. E. J. Miller, chemist in the plant pathology laboratory, Ministry of Agriculture, Fisheries and Food, and Dr. R. E. Stuckey, SAC hon. secretary

this defect in the earlier law by forbidding the addition of any poisonous or deleterious substance in food except where it was required or could not be avoided, and providing Governmental regulation on the quantity that might be present without hazard to the public health. It permitted however, untested or inadequately tested chemicals to enter the food supply, even when under investigation.

Since 1945 many chemical products had been suggested for possible use in foods. The dangers of these were brought to public attention in 1950 to 1952, and a number of proposed laws had been before Congress.

Before a new food additive was used commercially, Dr. Larrick and Dr. Lehman suggested that the following general requirements should be met:

Thorough testing of the additive to show its effect in treated foods, what residues remained from the additive, or what reaction products resulted from its use. Animal feeding tests should show that exaggerated use of the additive produced no harmful effects, or if effects were shown, at what levels these occurred.

Results of such tests should be submitted to the Government, who should agree that the additive was safe and issue an appropriate order. It was considered that the terms 'food additive' or 'chemical additive' should be broadly defined and substances generally recognised as safe, e.g. table salt, could be exempted from the definition. It was also stated that there should be adequate safeguards against arbitrary or capricious Government decisions.

The authors referred to problems arising from uses of antibiotics which was to be discussed in detail in the paper by Dr. Welch. It was stated that coal-tar colours were causing concern. After the 1938 FDC Act a list of coal-tar colours which were harmless, was drawn up. The great progress in the science of pharmacology and improved techniques had indicated that colours formerly considered harmless could produce adverse effects when fed to test animals in relatively high dosage. While these were not harmful when used in ordinary concentration in food, they did not meet the US legal requirements. Two orange colours and a red colour had been removed from the list eligible for certification for internal consumption (see CHEMICAL AGE, 1956, 29 September) and the FDA was at present in the process of removing four yellows (CA, 1957, 6 April).

This action had been misinterpreted, the authors stated, some people considering this implied that coal-tar colours were capable of causing cancer. They did not know of any evidence that any coal-tar colour now permitted in food, or any of the three colours recently removed from the list of permitted colours, was capable of causing cancer when added to food.

Following press publicity of a cancer conference, it had been suggested that an additive should not be allowed in food if it produced any cancer in a test animal. The implications of this were considered and it was felt that testing in animals was out of perspective with normal habits. The addition to food of any new chemical was not suggested, however, until reliable tests had shown beyond reasonable doubt that cancer or some other disorder was not produced when the chemical was eaten.

Consideration was also given to the question of how much animal testing was needed to show the safety of a new chemical. It was thought that studies should be supplemented by another feeding test on another animal, such as the dog, to detect species differences. However, no simple rigid programme could be laid down to give all the answers about safety.

Concluding their paper, Dr. Larrick and Dr. Lehman stated that a chemical should only be allowed in food if it served a useful purpose. No available procedure would give absolute assurance that food containing an added chemical was completely safe to all men, but it could be determined beyond reasonable doubt that a proposed use was safe.

VOLUNTARY CONTROL IN UK OF PESTICIDE USE

DISCUSSING the 'Practice in Great Britain in regard to pesticide residues in foodstuffs' Dr. E. J. Miller, chemist in the plant pathology laboratory, Ministry of Agriculture, Fisheries and Food, said that the present aim was to control hazards arising from the use of pesticides (as confined not only to the usual chemicals but also to growth depressants, growth stimulants, defoliants, fruit thinning and setting agents) by voluntary means rather than legislation. To this end, there was an advisory committee, established in 1954, which advised the Government of *all* risks arising from the use of pesticides in agriculture and food storage. This committee had arisen from a recommendation made by the Zuckerman Working Party set up in 1950 to investigate these risks.

On the rostrum, left, Dr. N. C. Wright, chief scientific adviser (food) to the Ministry of Agriculture, Fisheries and Food and E. Voelcker, Association of Public Analysts

Work of the advisory committee dealt with risks to operators, risks to consumers of treated crops and risks to wild life. Reports on all these aspects of its work had been published.

Administrative and technical representatives of the committee were drawn from the Ministeries of Health and Agriculture, Fisheries and Foods, Board of Trade and the Government Chemist, Medical and Agricultural Research Councils and the Nature Conservancy were also represented.

Apart from general provisions of the Food and Drugs Act, control of risks to consumer and wild life rested mainly on the continued co-operation with outside bodies such as the pesticide manufacturers, agricultural spraying contractors, and growers. Liaison between the officials of the advisory committee and the sub-committee was achieved by means of panels of representatives from the sub-committee and interested organisations. Eight panels had been formed, dealing with such topics as residue analysis, organo-mercury compounds and arsenicals.

The sub-committee collected and studied information on a pesticide. If data were considered adequate, a number of recommendations were formulated and passed to the advisory committee. With a crop protection product, copies of the recommendation are circulated to the official Agricultural Advisory Services, the National Farmers' Union, trade journals, the Association of British Insecticide manufacturers (representing 90% of manufacturers in Great Britain), etc. The ultimate user therefore received the same advice on the label of the product, or in a trade

journal or from an agricultural advisory officer. A similar procedure was followed for a chemical used for protection of stored products, the appropriate organisation in this case being the Industrial Pest Control Association.

Concerned with risks to users was the Agriculture (Poisonous Substances) Act 1952, recommendations of which varied according to whether a pesticide was considered to be too toxic so that its use was banned, or was sufficiently toxic to be controlled by Regulations made under the Act. If a chemical was considered insufficiently toxic voluntary precautionary measures were suggested.

Inhalation risks of chemicals named in the Agricultural (Poisonous Substances) Regulations were at present being studied by the Plant Pathology Laboratory, said Dr. Miller.

It was felt, Dr. Miller stated, that this country did not know enough about the accuracy and reliability of methods of residue analysis to recommend tolerance levels for residues in foodstuffs. The problem was being investigated by the Government Chemist's laboratory, the intention being to improve existing methods —if necessary to devise new ones—of residue analysis for selected chemicals. Until residue levels could be fixed and their enforcement secured, advising restrictive conditions on the use of a pesticide was being tried. If these restrictions were observed at the time of harvest the residue, if any, would be of such an order that, as far as was at present known, it was harmless. It was the toxic nature of the chemical under consideration that would determine which restrictions would apply. Information was required, said Dr. Miller, both on the amount of pesticide which got into the crop at the time of treatment and on its fate during subsequent storage and distribution.

Dr. Miller spoke of a voluntary notification scheme, recommended by the Zuckerman Working Party, which had recently been agreed with the trade. This allowed firms discretion when notifying, for they were required to notify only if a toxic hazard (or increased hazard in the case of change of formulation) was likely to arise with use of their product. Even before introduction of this scheme informal notifications had been received, and it was thus believed that this scheme would prove workable.

UK Practice on Additives Intentionally used in Food

IN no branch of science had the advance been more rapid or more extensive than in the variety of chemical substances potentially available as intentional additives to foods, said Dr. N. C. Wright, C.B., chief scientific adviser (food) to the Ministry of Agriculture, Fisheries and Food in his paper on 'Practice in Great Britain in regard to Additives Intentionally used in Food'. He considered it was right that, provided the interests and health of the consumer were safeguarded, advantage should be taken of their beneficial effects. There were, however, new and difficult problems to Governments and other authorities responsible for protecting the consumer against preventable hazards and the risks of deception. Dr. Wright then described briefly the official machinery available in Great Britain for this purpose.

Most recent of the food laws was the Food and Drugs Act, 1955 for England and Wales and the corresponding Scottish Act, the Food and Drugs (Scotland) Act, 1956. In these acts intentions were expressed in broad terms; and they vested in Ministers concerned powers to make regulations 'prohibiting or regulating' the addition of substances to food intended for human consumption. As supplements to the general provisions of the acts, the regulations were of advantage in being made more quickly and amended and in specifying in greater detail, the measures necessary for consumer protection and in providing clearer guidance to the Local Authorities (responsible for enforcement measures).

For regulations relating to food composition, there had been set up the Foods Standards Committee, which was appointed by Ministers and contained members nominated by the Medical Research Council, the Association of Public Analysts, the food industry and also officials of the Government departments most closely concerned. The FSC occupied a central position in the field of food additives in that it had the ultimate responsibility for recommending measures for control of their use. Its terms of reference were wide, relating to food standards in general, descriptions and labelling of foods. The task of dealing with major groups of food additives was undertaken by a special sub-committee under the chairmanship of Sir Charles Dodds.

The Public Health (Preservatives etc. in Food) Regulations had remained substantially unchanged since 1925 and covered preservatives, colouring matters, and certain miscellaneous additives such as thickening agents. Methods of control were: a permitted list (specifying quantities) for preservatives, a prohibited list of colouring matters and a blanket prohibition for thickness in cream. These regulations were the starting point for the sub-committee's review.

Antioxidants were dealt with first, then colouring matters, followed by emulsifying and stabilising agents (surfactants in US) and finally preservatives.

Discussing the sub-committee's work Dr. Wright stated that it had no biological testing facilities at its own disposal and there was a serious shortage of such facilities throughout the country which inevitably would constitute a severe handicap to rapid and adequate assessment of health hazards. Reports of the sub-committee, after endorsement by the FSC, were published and interested parties could submit any observations.

Colouring Matters

A notable advance in the sub-committee's work was the new regulations announced a month ago governing the use of colouring matters in food. These embodied a permitted list of certain colours of natural origin and of 30 coal-tar colours in place of a prohibited list of certain metallic and vegetable colours and five coal-tar colours. As against the original prohibition of five coal-tars, the permitted list had, in effect, resulted in the prohibition of use of 70 coal-tar colours. This list would also effectively prevent the use in food of any new and untried colours until these had been shown to have no detectable health hazard.

Other important recommendations accepted were; first, prohibition, irrespective of harmlessness of colour, of the use of colouring matters in unprocessed meat, fish, fruit and vegetables and secondly, approval in principle to formulation of specifications of purity of the permitted colours drawn up with the assistance of the British Standards Institution.

Regarding antioxidants, Dr. Wright said that a report containing the sub-committee's recommendations had been published, representations had been received and considered and the Ministers had agreed that certain specified antioxidants could be used. Regulations concerning these were being prepared. The report on emulsifying agents had been published and representations were now being examined. Preservatives were still being reviewed by the sub-committee. An added complication here was the use of certain antibiotics as preserva-

Sir Harry Jephcott, chairman DSIR council (left) with Charles Adams, former director of Food Standards Division, Ministry of Food, and John L. Harvey, deputy commissioner, Department of Health, Education and Welfare, US Food and Drug Administration

tives. A special Antibiotics Panel had been set up and was engaged, in association with the sub-committee, in examining medical aspects of the problem.

Reference was then made by Dr. Wright to the value of international co-operation in the control of food additives. As neither WHO, nor the Food and Agriculture Organisation of the US were directly represented at the conference, he had been asked—as chairman of the Geneva conference on food additives in 1955—to refer to their activities in the international sphere.

It was noted that at present there was only one synthetic colour which was common to the permitted lists of all those nations which had such lists. While Dr. Wright thought that uniform regulations were not necessary in every country, he thought that maximum area of agreement should be the aim. Advantages to international trade were obvious; less obvious, but perhaps no less important, were the benefits to be derived by governments if their decisions were based on the widest measure of agreed scientific opinion and their actions conformed as closely as possible to those of other countries.

In this respect, the approach adopted by the Geneva Conference was fundamentally sound. It sought first the formulation of general principles to govern use of food additives and thereafter formulation of suitable methods of biological testing of such additives and interpretations of the results. The first report of one of the two expert committees appointed had been published; the second report should not be long delayed. It was hoped that in the control of chemical additives in food they would contribute, as would the conference, to increased international co-operation and eventually to a wide measure of international agreement.

G. W. Finch (Fullers), left, with D. Simmance (Horlicks Ltd.)

WORLD CO-OPERATION SOUGHT ON CONTROL OF ADDITIVES

WITH the great number of chemical substances now being put forward as of some value or other in producing, processing or preserving our food, the subject of chemical additives was one of great international significance. This view was expressed by Dr. C. A. Morrell, director of the Food and Drug Directorate, Department of National Health and Welfare, Canada, in his paper dealing with the control of chemical additives in foods other than antibiotics. Dr. Morrell's paper was read by Dr. Bernard L. Oser, director, Food Research Laboratories Inc., of New York.

In his paper Dr. Morrell said that the potential public health hazards and other problems presented by the increasing use of chemical additives in foods had recently been drawn more strongly to the attention of those administering food legislation. The public was aware of changes in the marketing and processing of foods without knowing what was involved and they wanted assurance that the safety of their food was being maintained. The government had the responsibility of protecting the safety of food supplies and of maintaining public confidence in the safety of food. These functions he felt should be carried out by that branch of government concerned with health and welfare.

Dr. Morrell believed that industry would readily concur that government should exercise its authority in this field provided all parties could agree on what information was necessary to establish the safety of chemical additives before use. This appeared to be the crux of the problem.

The safety of the substances under the conditions of use to which they would be put could only be determined after a great deal of work in many fields of science. The author was certain it was a task that Canada could not carry out alone and he doubted if any one country could deal thoroughly with the many products already proposed for use in or on foods in a period of time that was reasonable and practical from the commercial viewpoint.

One had to consider also that the government department or bureau would always have very limited facilities and numbers of personnel in comparison with its responsibilities in this and other fields. It was suggested that it would not be acceptable to taxpayers that the government should engage in research on a virtually unlimited scale to satisfy the demands of specific groups of citizens for information that in many cases would not benefit the country as a whole, and in the case of failures to develop something useful, would benefit no one except those employed to carry out the investigation.

This was not to say that some types of investigative work on chemical additives in foods should not be carried out by government departments or agencies but the work of the government control authority would have a different emphasis or possibly a different direction than that required by industry. Research of the type concerned with specific information, either in confirmation or refutation of claims, or for the purpose of developing quantitative methods of analysis or the establishment of standards, was often necessary.

It was in deciding about this pattern of testing that international co-operation and agreement were valuable. There was disagreement among some of the experts as to what amount and kind of information was necessary before a decision could be made as to the safety of a product. There was also too much experimental work on too many products to expect agencies or industries in any one country to provide all the answers. This was particularly true for those countries with smaller industrial and government facilities. According to Dr. Morrell there were, therefore, two aspects of the subject in which international co-operation was valuable, (1) the pooling of information, and (2) uniformity in patterns of testing required by different countries. He asked that governments and industries should support the efforts made by the World Health Organisation and the Food and Agriculture Organisation in this field of public health.

Biological Nature

The majority of the investigations of a biological nature were necessarily carried out on animals and the results had to be interpreted in terms of human safety. This was believed to be an uncertain procedure and was a contentious one. In investigation of new drugs evidence was required of safety both from the laboratory and the clinic. What part should the clinical trial play when gathering evidence for the safety of chemical additives? The problem of the new chemical additive was different from that of the new drug in that it was not intended to be used in an amount that would produce any effect on the consumer of the food. The purpose was, in fact, to make certain that the amount used had no influence whatever on his physiology or structure. Could this amount be determined with certainty when tests on animals were the only ones used? He hoped that the answer for practical purposes would be 'yes' because of the amount of work and time and money that would otherwise be necessary.

In dealing with chemical additives, governments usually found it satisfactory to establish tolerances for the substances proposed. A tolerance was the maximum amount of the chemical substance that was legally permitted in or on food as consumed. Dr. Morrell suggested that tolerances should be established for all chemicals presenting a potential hazard and accepted as necessary in food. These included pesticides, preservatives, colours, emulsifiers, etc. The amount of the substance tolerated should not be greater than was necessary for the purpose for which it was added. This amount should always be less than the safe amount and was usually very much less. For the purposes of international commerce it was advisable to establish the same tolerances in different countries.

Concluding, Dr. Morrell said that one other aspect of chemical additives deserved more consideration. This was that chemicals should not be added to foods unless there was a real need for them and their use was of some advantage to the consumer.

Difficulties Facing Analysts on Chemical Additives in Food

Discussion on Morning Session

OPENING the discussion at the morning session on the papers that dealt with chemical additives other than antibiotics, *Mr. G. Taylor*, a past president of the SAC and the Association of Public Analysts, said it had been a privilege to hear four such authorities on control of chemical additives. All aspects of that subject had been covered, but he was somewhat concerned over the light-hearted treatment of enforcement, other than Dr. Miller's remarks. Mr. Taylor went on to say that the question of food additives was dependent on chemical analysis. He knew that analysts were mostly one step behind. But the present problem was one that should be before the analyst. In England control of chemical additives was administered by the Food and Drugs Act and food authorities. That is, it was decentralised. In the US, as he understood it, administration was by the Food and Drug Administration of the US Department of Health, Education and Welfare, and this was an autonomic body. It was in the various sections of the FDA that analysis was done.

Dr. Miller had shown, and it was common in England now, that manufacturers would present information and analytical data. But in the US, Government analysts were informed at an early date.

A 'Turn' Behind

Mr. John L. Harvey, in reply, said that in the US there were 48 state and several independent food and drug associations who all carried out investigations. He said that one of the problems was that the analyst was a 'turn' behind. One of the present proposals being debated (under the pesticide law) was that a satisfactory quantitative and qualitative method of analysis should be at hand.

Mr. C. W. Dunn said that, through his modesty, Mr. Harvey had not said what a magnificent administrative job the US FDA was doing. One of the constructive measures of the FDA was to have scientific conferences to discuss questions and obtain general information. The FDA had in fact called for a conference with leading manufacturers in November. It was hoped through this conference to set up a permanent 'watch-dog' committee. The chairman went on to say that the US believed in strong enforcement of the law. They had to prosecute violaters of the laws to protect the public health.

Mr. R. S. Link, Bowater Research and Development Co., remarked that whereas the conference was concerned with chemical additives in foodstuffs, there was the coincidental addition of chemicals to crops or foods, as for instance, when they were being packaged with paper wraps and plastics materials which contained plasticisers. 'This matter must command our attention,' he stated.

Mr. Harvey replied, saying that a new amendment by the FDA proposed to take note of this matter.

Professor A. C. Fraser, Birmingham University, considered that the conference had listened to a very clear exposition on control of food additives. He wished to comment firstly on the question of tests. He said that people who suggested tests had never done tests and never intended to carry out tests. They were quite out of touch therefore with the work involved and the number of animals required. He had been associated with the WHO panel on this subject, and while the panel's report had not been published yet he felt he could say there was fairly substantial agreement on the question of tests.

Professor Fraser's second comment was that there was need for more research in the field of food additives, regarding which methods could be safely discarded. There was a lack of information about raw material by the food expert. This second point had been touched upon, but with regard to tolerance limits Professor Fraser said that these could not be prescribed unless they could be enforced. These would be more fundamental if there were tests.

Thirdly, he mentioned flexibility of regulations. If a substance used in food A was found to be useful in food B, there would need to be considerable flexibility.

Dr. N. C. Wright, who answered, said he did not think any response was required since Professor Fraser by sitting on the WHO panel had contributed the answer. On the question of flexibility tolerances, Dr. Wright said these were being looked into in the UK. It was being done by regulations which could be altered quickly by Parliament.

Mr. Harvey, also replying to Professor Fraser, referred to the Miller Pesticide Amendment and said that there were now 90 basic applications regarding the use of pesticides or crops, which were constantly being amended. In the US, there was flexibility, for as soon as an application was verified it was published.

Dr. J. H. Hamence, president, SAC, and a consultant food analyst, said he was very disturbed when he heard from Dr. Miller that analytical methods were so unsatisfactory that a recommendation on what was a potentially dangerous substance could not be made. He wished to know whether the US had found methods of analysis used for residues satisfactory. He would ask the UK side whether the careful methods of analysis of residues were required, and he referred to the carelessness of farm workers in eating food after using toxic chemicals, yet who appeared to suffer no ill-effects.

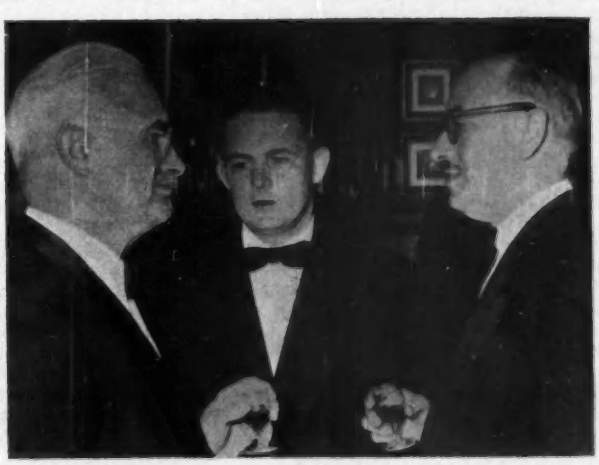
Dr. Miller said that the question of the farm worker was covered by regulations. He referred to the investigations by the Zuckerman Working Party. There had been no reports of deaths due to residues on food, etc. If dangers had to be evaluated, it was going to take a long time. At present the onus was on the manufacturer regarding safety. He instanced a chemical now in use in the UK which had no known methods of analysis. This pesticide (a combination of two chemicals) in the plant formed three or four different toxic derivatives. The manufacturer had supplied residue data based on radioactivity studies. This was not applicable with the commercial product. Therefore, this might mean that on a careful system of analysis this chemical could not be used.

Tolerance Limitations

Dr. B. L. Oser said that the need for the accuracy of analytical methods arose from tolerance limitations. It was quite easy to establish whether a residue was above tolerance levels. He thought the conference might be interested to know that in Paris last week at the meeting of the Union of International Pure and Applied Chemistry an *ad hoc* committee had been set up to explore difficulties of residue analysis, etc., from the point of view of the chemist.

Mr. Dunn intervened to say that as fast as they were known the FDA should publish methods so that all concerned have the same facts. In the US the food industry was working on the various problems, and work was also being done at universities, research associations and by OEEC.

Dr. Eric C. Wood, a public analyst, also referred to methods of analysis. He wished to cite an example with which he had recently been concerned. Runner beans had been sprayed with a German pesticidal preparation three weeks before harvesting, which was in accordance with the manu-



At the dinner held in Apothecaries' Hall, l. to r., John L. Harvey, deputy commissioner US Department of Health, Education and Welfare, F. Hart of the FLI, and Hugh C. Freeman, chemist with British Arkady Ltd.

facturer's instructions. In the UK the crop could not be sprayed with this pesticide within six weeks of harvesting. The prospective buyer of the beans had refused to take them. A lengthy method of analysis only was available during which procedure the beans would spoil. Speedy analytical methods were required, combined with some official tolerance limits.

Secondly, said Dr. Wood, he wanted to refer to animal testing. He wished to emphasise species differences. This had been sharply brought to his notice. A chemical additive used with one form of poultry was safe but used for another type of poultry resulted in death.

Dr. Miller, in reply, said that he felt Dr. Wood had partly answered his own question. From his understanding of the matter, Dr. Miller said that in the matter of the beans the pesticide should be used with a six-week interval before harvesting. He believed he knew the pesticide which had been used and he hoped it would not be used for runner beans. Were the crop taken and sold, the residue could be estimated and toxicity levels estimated.

Mr. N. Goldenberg, Marks and Spencer Ltd., asked Dr. Wright about preservatives, referring to the delay in publication of standards, and said he appreciated the difficulties confronting the standards committee, but he felt there should be a list published of those preservatives as they were established.

His second question was concerned with food being contaminated by space sprays, e.g. aerosols, which contained DDT or lindane. There had been a report on this matter by the American Food Association. He would therefore like to hear views on this from the US and UK.

Dr. Wright informed Mr. Goldenberg that the sub-committee had not given its views as yet as it had preferred to look into principles first, otherwise a precedent might be established, with regard to preservatives. The committee could be asked by the manufacturer, etc., to deal with an isolated item but it would put back examination of other items.

Dr. Oser, for the US, said that provided the permitted residues on food were within tolerance limits, sprays were in order.

Dr. Harvey, also for the US, said that the legal position was not one that was always carried out. As a pesticidal spray, a preparation had to be approved by tolerance limits. He referred to the paper by Dr. Welch which he had read to the conference regarding market milk. The US was examining the position. Confronting them were such problems as synergistic and booster effects of additives.

Summing up the discussion, Mr. Dunn said the problems in the US and UK were similar. There were differences in scientific control, methods of analysis and in legal and legislative procedure. Mr. Dunn considered that all would benefit by trying to reach a common level on these problems. By the discussion at this conference, a common understanding of these had been attempted.

UK Position on Use of Antibiotic Food Additives

THE PRESENT legal position relating to the use in Great Britain of antibiotics for any purpose and an enumeration of what appeared to be the hazards most deserving examination due to the presence of antibiotics in human food were summarised by Mr. A. L. Bacharach, chairman, *Sous-Commission* on Antibiotics in Foods, in his paper in the section 'The control of chemical additives to food with special reference to antibiotics'.

In Great Britain at present there were only a limited number of ways of introducing antibiotics in food, due to limitations imposed by law or as practised by agreement with the authorities. Reference was made to the control of penicillin by the special Penicillin Act from 1944 and the subsequent control of streptomycin, chloramphenicol and chlortetracycline. These antibiotics and others were later brought within the ambit of the consolidated Therapeutic Substances Act 1956. This Act, which came into operation in 1956, and the regulations made under it, were the administrative responsibility of the Ministry of Health. The aim had always been, albeit for a number of different and changing reasons, to prevent the use of antibiotics by any but medical or veterinary practitioners. This had involved the surveillance and licensing of manufacturers as well as powers over distribution.

Consideration also had to be given to overcoming the problem of amending an Act of Parliament every time a new antibiotic came into general use or an old one was discarded. By means of naming in a schedule to an Act or a regulation to an Act, amendments could be made.

When the value of including antibiotics in rations of young growing livestock was accepted, penicillin and chlortetracycline, both named in the relevant schedule, were expressly exempted from the operation of the Therapeutic Substances Act, if they were used in animal feeding-stuffs under carefully defined conditions.

There was nothing in British legislation, as far as the speaker was aware, about feeding-stuffs to prevent such additions. Scheduled antibiotics, with the exception of the two noted above, were at present absent from feeding-stuffs (and so from foods) by a negative ban of the Ministry of Health and not by a positive ban of the Ministry of Agriculture, Fisheries and Food. Antibiotic substances not scheduled, stated Mr. Bacharach, were absent because no one, at present, wanted to put them in. This position could easily change, for nutritional or for economic reasons. Legal and administrative action required for control would be relatively easy.

By the present Food and Drugs Act 1955, which came into operation on 1 January 1956, a preservative (among other food additives) could not be added to a food unless mentioned by name in regulations made under the Act. Recommendations on the use of preservatives was the responsibility of a food standards committee and acceptance, or rejection, of these was the function of the Ministry of Agriculture, Fisheries and Food.

At present, there was no permission to use any antibiotic as a preservative food additive.

The use of a scheduled antibiotic for such a purpose would involve legislative action under two separate Acts—an admirable safeguard for the health of the community.

Under present regulations 13 antibiotics were controlled under provisions of the Therapeutic Substances Act. These were: bacitracin, chloramphenicol, chlortetracycline (aureomycin), erythromycin, neomycin, novobiocin, oxytetracycline, penicillin, polymixin, spiramycin, streptomycin, tetracycline and viomycin. Of these only three — chlortetracycline, oxytetracycline and penicillin—could be used in animal feeding-stuffs and concentrates. However, outside the above 13, any antibiotic substance was freely available to anyone who could buy it or make it, provided existing legislation was respected.

Attention was drawn to a loophole in the existing regulations. Farmers were known to be feeding antibiotic-containing feed supplements to stock at levels high enough to exert therapeutic effects.

The treatment of mastitis in cows with penicillin, etc., was mentioned in relation to infringement of the law on liquid milk in this country, which stated it was illegal to abstract or add anything to milk.

Problem of Nisin

Nisin, increasingly used by cheesemakers to suppress unwanted micro-organisms, was a problem since it could cause spoilage of fresh and processed cheese. Under the Therapeutic Substances Act nisin was not an antibiotic; neither did it appear as a preservative under the Food and Drugs Act. Tetracycline to prevent bacterial spoilage in whole carcasses was not legal.

Notatin, which could hardly fail to be considered an antibiotic, was an oxidative enzyme able in the presence of glucose and catalase to deoxygenate closed containers. It was used in preventing oxidative deterioration of canned and bottled fruit. Mr. Bacharach asked—was it an antioxidant, a processing agent, a preservative? He could only say for certain it was not a colouring matter—and probably not an emulsifying agent. He thought it would be interesting to know whether its use was legal.

A third use of antibiotics was as pesticides in agriculture and, more particularly, horticulture. In Great Britain there was no legislative ban to the use of any substance on crops. There was, however, a 'gentleman's agreement' between manufacturers of pesticides, etc., and the Ministry of Agriculture not to use such products until agreement had been reached between them as to its nature, formulation and mode of administration. Recommendations on residual limits of pesticides were also needed from the food standards committee.

Mr. Bacharach said he had suggested

that either the manufacturer or the intending user (or both) should supply essential analytical procedures capable of establishing the presence or absence of the antibiotic in the foods involved and under proposed conditions of usage. Support for this view was to be found in the just published FAO/WHO Report of its Expert Committee on Food Additives.

Mention was also made of the part played by the Medical Research Council on toxicological aspects. At present, the use of antibiotics in meat and fish preservation and the use of antibiotics for protection of fruit crops was being studied by the various official bodies.

Discussing the hazards to the public from frequent or even continuous consumption of foods containing small or

J. W. Sawtell, Beecham Foods Ltd., left, with V. C. Hender, Mars Ltd.

residual quantities of antibiotics, the speaker said that many of the possible objections raised would apply equally to the use of any preservative other than one that was non-toxic to man and yet indiscriminate in its bactericidal action. No such preservative was known or likely to be known.

It had been suggested that food spoilage organisms should be left as 'tell-tales' for the presence of pathogens. This was not good food technology, Mr. Bacharach stated; he doubted if it was even good bacteriology.

On the possibility of carcinogenicity, allergy and other ill effects arising from use of antibiotics, the speaker said much the same as Dr. Thatcher and Dr. Morrell. He felt that the particular hazard of carcinogenesis must be left for the future to consider. Of milk containing detectable quantities of antibiotics, particularly penicillin, he remarked that resident quantities were known to be small or even minute, and that the antibiotic present was subject to destruction by heat and digestion, among other factors. For his part, Mr. Bacharach was satisfied that the present levels of use from this source (milk) involved no risk of invoking allergic response in the consumer or of causing him to harbour strains of antibiotic-resistant pathogens or other undesired micro-organisms.

Build-up from successive low level bacteriostatic doses of drug-resistant pathogens and the possibility that so-called decomposition products of an antibiotic produced during processing or digestion, might be toxic, were briefly considered. Due to the instability of antibiotics the first would appear to be unlikely while it was certain that antibiotic decomposition products would not be bactericidal or even bacteriostatic.

Regarding allergies, Mr. Bacharach reminded the audience that a very few individuals in relation to the total number who had received antibiotics, had an abnormal sensitivity to certain antibiotics. The chances of sensitisation through meeting the right antibiotic in food in the right quantities and under the right conditions to evoke serious allergic responses seemed infinitesimal. There was not the slightest evidence to date regarding such sensitivity. Useful knowledge would be provided, and added confidence, if there were quantitative experimental results as data on which to base realistic limits of tolerance for antibiotic additives and residues in foods.

Concluding his remarks on allergy Mr. Bacharach suggested the allergic subject created problems not for lawyers and legislation but for the medical profession.

Conference Dinner to FLI Members

ALTHOUGH the UK was the first of the English-speaking countries to pass a specific law for the control of foodstuffs, in 1860, it was left to the US to make the most progress in bringing food regulations up-to-date. This point was made by Sir Harry Jephcott, chairman of the council of the Department of Scientific and Industrial Research, when he proposed the toast 'The Food Law Institute of the US' at a dinner on 26 July.

Held in the Apothecaries' Hall, London, the dinner was given to members of the institute by the food group of the Society of Chemical Industry, the Society for Analytical Chemistry and the Association of Public Analysts. Mr. Justice Lloyd-Jacob presided.

Sir Harry said that there was no organisation comparable to the Food Law Institute in this country, where the food regulations were administered by nearly 500 different authorities.

Mr. C. W. Dunn, president of the institute, said in response that the FLI was set up by leading US food manufacturers as a contribution to the national welfare. The object was to introduce instruction in the food and drug laws, in the law schools and in the universities. He described their meeting that day as a 'unique and historic international occasion'.

The toast 'Our Guests' was proposed by Dr. D. W. Kent-Jones, and was responded to by Mr. Churchill Rodgers, chairman of the section of corporation, banking and business law, American Bar Association.

Following the speeches, Dr. A. J. Amos, meeting hon. secretary, announced that the three UK organisations that sponsored the meeting wished to present an illuminated address to Mr. Dunn to mark his pioneer work on food laws and the occasion of his birthday. The presentation was made by Dr. Amos, representing the SCI food group, Dr. J. H. Hamence representing the SAC and by Mr. E. Voelcker of the APA.

Reports of other papers presented during the session on antibiotics will be published in CHEMICAL AGE next week, with a summary of the discussion.

Draft Regulations on Ionising Radiations

PARLIAMENT is to introduce legislation to safeguard workers employed in industry against the effect of ionising radiations. A code of regulations has been drawn up in draft form and published by HM Stationery Office (Factories (Ionising Radiations) Special Regulations), so that the various organisations concerned may consider them and raise any points they may have with the Ministry. Representations should reach the Ministry of Labour and National Service, 19 St. James's Square, London SW1 by 31 October 1957.

The present draft covers the major part of the problem arising in industry from the use of ionising radiations. It lays down regulations for two methods of protection, by 'adequate shielding', or where that is impractical, by 'adequate protection'. It provides for measurements to be made of the intensity of radiation from plant and equipment housing sources of ionising radiations and of radiation doses received by workers. Provision is also made for the proper storage of radioactive material sealed in containers, and for maintaining them in such condition as to prevent any leakage. The arrangements to be made for medical supervision and medical examination are prescribed.

The schedule to the regulations sets out the maximum permissible doses of radiation. The doses vary with the type of radiation and the part of the body under irradiation.

Water Treatment Society Annual Meeting

ANNUAL MEETING of the Society for Water Treatment and Examination will be held at the Palace Hotel, Southend, on 2 to 4 October.

Papers to be presented are 'Isolation and importance of salmonella in sewage polluted waters' by Dr. J. H. McCoy, and 'Practical methods of the purification of saline and brackish waters' by J. E. Emmett. Mr. D. H. A. Price will present a paper on the work of river boards in relation to public water supplies.

A programme of films has also been arranged, together with visits to May and Baker Ltd., Dagenham, and the Sandford Hill water treatment works of Chelmsford Corporation.

THE OLD order in textile chemicals changes and out with it goes the starch glue and Epsom salts. Forty years ago they were bought cheaply, applied easily and used commonly. Now, the chemicals used in the mills are costly and methods of application complex. As a result prices are higher. But with the increasing use of new chemicals comes a range of new properties undreamt of by older generations of textile chemists.

Some of these were mentioned by Mr. Percy A. Holt, joint managing director of the Bradford Dyers' Association at the British Man-Made Fibres Conference and summer school at Oxford last week. He described new resins and chemical products for stabilising, crease resisting, softening, stiffening, waterproofing and fireproofing that 'pour into the finishers from the chemical industry'.

Mr. Holt particularly referred to a new finish for woollen goods which is said to be proof against oily or fatty stains. Based on a new chemical from the fluorocarbon field, it repelled oil stains and water-borne stains.

Two of the delegates to the 16th Congress of the International Union of Pure and Applied Chemistry attracted attention at the banquet held in the historic Orangerie at Versailles because they were not in evening dress. They were among the 15 Soviet chemists scheduled as congress members.

A correspondent tells Alembic that he spoke to them in English and to his surprise they replied in passable English. They were physical chemists working in a Moscow research institute and were excited about their first visit to the West. They were almost pathetically keen to know something of life in Britain, which they hoped to visit one day. Matters concerning salaries and conditions of work of chemists in England interested them greatly, as did housing conditions in this country.

ALEMBIC learns that the new benzene refining exhibit at the Science Museum incorporates a number of new techniques to represent rising vapours and falling liquids; they were constructed by Mr. G. T. Porter of Southgate.

The exhibit traces the interesting story of benzole, which began when an Arabian traveller brought back from Java a sample of luban javi, or frankincense of Java. Later this name became banjawi, benjui, bonzoin and is now known as gum benzoin. Turquet de Mayerne found in 1608 that by heating benzoin he could obtain crystals of 'flowers of benzoin'. These crystals were in fact benzoic acid, and in 1834 Mitscherlich produced benzene from them by distillation with lime. Faraday had obtained the same material nine years earlier from compressed oil gas.

It is not clear who first obtained benzole from coal carbonisation, but by 1848 Mansfield had developed a still for distilling benzole from coal tar. Coupier's still for purifying benzole (1863) was one of the earliest to be used on a practical scale. These methods with the modern techniques of extraction and distillation are shown by models.

The exhibit was formally handed over on Monday by Mr. N. W. Blundell, president of the National Benzole Association, and received by Dr. T. C. S. Morrison-Scott on behalf of the museum.

WORKERS in the chemical industry seldom appreciate the significance of their work as only rarely do they get the opportunity of relating it to the end product, which is often far removed from the chemicals they help to make.

So to remedy this, Midland Silicones Ltd. last week took their 'Silicones in Industry' exhibition down to their plant in Barry, South Wales, where it was shown to the workpeople. Among the exhibits they saw was a Triumph motor cycle engine which uses Silastomer silicone rubber washers to seal the push rod assemblies.

A NEW telephone system, large enough to serve a small town and costing over £70,000, has begun working at the Billingham division of ICI. It was inaugurated by Dr. S. W. Saunders, the division's joint managing director (technical).

The old exchange installed some 30 years ago could not cope with the organisation's growth; some seven million internal and public exchange calls are handled each year. Initially the new equipment will cater for 1,400 extensions, but this can be extended to 2,000.

The new automatic exchange equipment, PABX 3, has several advantages over the old. Among the most useful is the push-button in each instrument which enables a public exchange call to be held while an internal extension is dialled for information.

IN THE coming months, members of the 12-man mission to Canada will be telling UK manufacturers of equipment for the oil and petrochemical industries of the great opportunities open to them in Canada. Something of the enthusiasm of the mission for this market can be gauged from the phrases used at a conference in London last week. Members of the mission talked of the market being 'ready for the picking', and of Canadian executives being 'embarrassingly keen to buy British'.

Canadian oil and petrochemical interests are expanding rapidly and are at present buying some 90–95 per cent of their plant and equipment from the US. The UK industry now enjoys only a miserable 5 per cent of the £275 million spent annually on capital expenditure; it should be possible to increase our stake in this vital market considerably. It is particularly important that our manufacturers should do so, for the Canadian petrochemical and oil industries are growing fast. There are prospects of Canada's population being doubled by 1980, so that any drive on the Canadian market now is a sound investment for the future.

The mission chalked up a notable record in Canada, for Mr. J. M. Storey, mission leader, tells Alembic that their draft report was posted to London from Vancouver on the last day of their visit to Canada.

AN UNUSUAL situation has arisen in the conflict of local authority against central authority. A proposal by the Beaver Committee recommended that certain industries should be the responsibility of the alkali inspectors for the purposes of the Clean Air Act. This proposal has been opposed both by the local authorities, who were previously responsible, and by the inspectors themselves who feel that it is adding unnecessarily to their work.

So strong is the feeling about the matter that the Association of Municipal Corporations is preparing a case against the Government. Among those contributing to the costs is Liverpool Corporation.

Support for centralisation comes from industry, Alembic has been told. Previously every local authority had set its own standards. Now the general feeling is: 'At last we shall know where we stand'.

ONE OF our readers has discovered a mistake in *Hansard*, the official House of Commons report. This occurred in a written question from Dr. D. Johnson (Cons. Carlisle) published in *Hansard*, 22 July, Col. 18. Dr. Johnson had asked the Home Secretary if he was aware of the propensity of arsenical colours in ancient wallpapers to liberate the poisonous gas dimethylamine.

Alembic has consulted a number of chemical dictionaries, but only one of them, published in the US by Reinhold, makes any reference to the toxic properties of dimethylamine. Mr. Peter Cooper, F.P.S., author of our recent series on 'Toxic Hazards in Industry' says this must be a misprint in Hansard, since 'dimethylamine is harmless'. He adds 'Presumably dimethylarsine was intended. The gas liberated by moulds from damp wallpapers dyed with copper acetoarsenite or copper arsenite is, however, usually claimed to be trimethylarsine. Conditions would have to be bad to make such wallpapers a health hazard, though cases of poisoning (anaemia) have been reported in the past.'

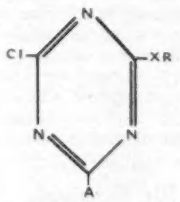
When Alembic contacted the *Hansard* office in the House of Commons on Tuesday, he was told the question would be investigated.

Alembic

New *s*-Triazine Herbicides Developed

INVESTIGATING *s*-triazines, H. Koopman and J. H. Uhlenbroek of the chemical research laboratory, NV Philips Roxane, Weesp. and J. Daams of 'Boekesteyn' Agrobiological Laboratory, Graveland, have discovered a new synthesis of 2-alkoxy- and 2-alkylthio-4, 6-dichloro-*s*-triazines (*Nature*, 1957, **180**, 147). These substances are obtained by the reaction of an alcohol or a thiol with cyanuric chloride and 2, 6 × collidine as the acid acceptor. Yield is stated to be approximately 80 to 90 per cent. It has also been found that chlorine can be specifically substituted in good yield by an alkylamino, alkyloxy oralkylthio group.

Strong phytotoxic activity was observed for many plant species with compounds having the structure:



where X is —NH—, —O— or —S—, R is an alkyl group and A is chlorine or YR (Y may be only —O— or —S—). Patents have been applied for, it is stated.

Substances investigated were 1 per cent solutions of 2-pentoxy-4, 6-dichloro-*s*-triazine (TR 110) in a quantity corresponding to 10 kg. per hectare; 2-n-butoxy-4, 6-dichloro-*s*-triazine (TR 14) and 2-n-butyl thio-4, 6-dichloro-*s*-triazine (TR 35). Triazines with a side-chain of three to six carbon atoms were found to have the highest activity.

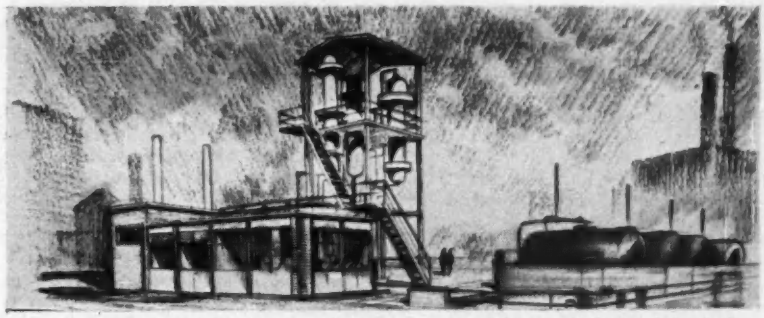
Herbicidal activity was determined by spraying weeds (e.g. chickweed, small nettle lambs' quarters) and blue grass, with 1 per cent solutions of TR 14, TR 35, 2-*iso*propylamino-4, 6-dichloro-*s*-triazine (TR 31) and 2, 4-bis (diethylamino)-6-chloro-*s*-triazine (Geigy 444) in a quantity corresponding to 10 kg. per hectare. Geigy 444 is stated to have caused only slight damage to the plant growth but with the other *s*-triazines all the weeds were killed with the exception of the blue grass.

Further extensive field trials are to be carried out.

Sir John Cockcroft to Chair Radioisotope Conference

CHAIRMANSHIP of the international conference on 'Radioisotopes in scientific research', to be held in Paris this September, has been accepted by Sir John Cockcroft, director of the Atomic Energy Research Establishment, Harwell.

It is expected that this conference, the largest yet to be organised by UNESCO, will be attended by more than 1,000 scientists. The conference programme, it is understood, has been drawn up by advisers from eight countries, including, Britain, the US, France and USSR. New ideas, and methods for the utilisation of radioisotopes in scientific research will be discussed.



An artist's impression of the plant for refining benzoles, naphthas, etc., which is being built at the Thorncliffe Works of Newton Chambers by arrangement with the Coal Tar Research Association

Newton Chambers Acquire World Rights of New Benzole Process

A PILOT PLANT for refining crude benzole, naphthas and other hydrocarbon oils, built at the works of Newton Chambers and Co. Ltd., Thorncliffe, near Sheffield, is the first result of an agreement made between the company and the Coal Tar Research Association. A hydro-refining process of improved efficiency has been developed for continuous operation as a result of research carried out by the association since 1952, and now the company has acquired world rights for manufacturing the plants to operate the process.

The CTRA process employs pure hydrogen or hydrogen-containing gases such as coal gas or coke oven gas in combination with a special catalyst for the preferential hydrogenolysis of sulphur compounds, gum-forming olefines and colour-forming bodies and the process gives a substantially theoretical yield of refined products.

It has been developed for continuous operation which can be completely automatic to ensure that the refined product(s) are consistently in accordance with the designed specification.

Present Process

Refining of benzoles and naphthas at present is generally carried out using a batch/intermittent process of agitation with strong sulphuric acid. In addition to the somewhat uncertain results, the acid washing process results in considerable losses of spirit of between 10 and 20 per cent, and the production of 'acid tar', disposal of which is extremely difficult. Naphthas cannot always be satisfactorily refined by washing with strong sulphuric acid.

It is claimed that the CTRA process differs from other hydro-refining processes for crude benzole by employing a considerably shorter contact time, thus giving a higher output for a given size of convertor and in operating at considerably lower pressures for naphtha refining. Consumption of hydrogen is, therefore, considerably reduced, with consequent savings, and the conversion of aromatics to naphthenic hydrocarbons is minimised.

The choice of hydrogenating gas and the general operating conditions best suited for the desulphurisation of a particular feedstock or range of feedstocks can at present be quickly ascertained in a small laboratory scale unit. In addition to these facilities, the new pilot plant of Newton Chambers is capable of dealing with 500 gallons of feedstock daily. This plant will be used to determine the optimum operating conditions, together with all chemical engineering data for any crude benzoles and naphthas. Its capacity is such that the products will be in sufficient quantity for market research or further investigation by interested parties.

It is considered that hydrogenation has great potentialities as a chemical engineering tool generally and in the coal tar industry in particular. The pilot plant has, in fact, been designed for wider operating conditions than those required for the hydro-desulphurisation of benzoles and naphthas so that it can be readily adapted for further investigations and development work in this field.

The Coal Tar Research Association is concerned with the investigation of general problems within the coal tar industry. Its member firms are tar distillers, steelworks owners, the National Coal Board, the gas boards, and other companies concerned with aspects of tar distillation and its by-products.

Newton Chambers and Co. Ltd., founded at Thorncliffe, seven miles north of Sheffield, in 1793, were pioneers in equipping the gas industry and their engineering division is also now busy making ancillary equipment for the steel industry. There is also a chemicals division.

Gas By-Products Output

The gas industry's crude tar production fell by 5 per cent in January–March, but by only 1 per cent in the year ended 31 March 1957. Production to 31 March totalled 1,988,000 tons (2,001,000 tons). Production of benzole was 8 per cent down in the period January–March, but was 1 per cent up on the 12 months ended 31 March; the year's output totalling 29.3 million gall. (28.9 million gall.).

VALUABLE CANADIAN MARKET FOR UK PETROCHEMICAL PLANT

BRITAIN'S contribution of equipment to the Canadian oil and petrochemical industries amounts to only 5 per cent of the total, with more than 90 per cent of plant and equipment coming from the US. This point was made at a conference held in London last week by Mr. J. M. Storey, managing director, Dwarance and Co. Ltd., leader of the economic, technical and goodwill mission, which recently returned from Canada.

The mission was sponsored by the Council of British Manufacturers of Petroleum Equipment. Its report, now in the hands of the printers, will be issued towards the end of August.

Mr. Storey made it clear that there is a vast and expanding market for UK plant and equipment in Canada; UK prices are right for the market, but attention must be given to delivery and service if Britain's share of Canada's vast and rapidly expanding market for oil and petrochemical equipment is to be enlarged.

Both Mr. Storey and Mr. Derek Walker-Smith, Minister of State, Board of Trade, who presided, referred to the recent statement of the Canadian Prime Minister that he was seeking to divert 15 per cent of Canada's imports from the US to the UK.

Mr. Storey stated that the Canadian oil and petrochemical industries were spending about £275 million a year on development projects, mostly in the US. The mission found an almost embarrassing willingness to buy British, provided price, delivery and service were right. Mr. Storey stressed that as far as price was concerned the UK manufacturers could quote prices below those of Canadian and US manufacturers.

Britain, however, lagged behind on delivery and service. The mission recommends that for the smaller UK firm a good start would be to co-operate initially with a Canadian agent, following this as sales built up by opening a separate Canadian sales and servicing branch. The next step would be to make arrangements with Canadian manufacturers for production facilities, the larger firms would be in a better position to set up their own branch factories.

It was pointed out that a UK manufacturer of petrochemical equipment and pipelines could cover three-quarters of the market from Toronto, although as business progressed another office in Montreal would be desirable.

In any sales drive, it was vital that contact should be made with the specialist contractors, most of whom had their head offices in the US. Contact should also be made with the companies' engineers, acquainting them with the product and establishing the existence of adequate local servicing and spare parts facilities.

It was stressed that equipment must be made in accordance with established standards, both as to physical dimensions and performance; in practically every case American Petroleum Institute (API) standards are used.

Harwell Research on Power From Controlled Thermonuclear Reactions

MAJOR achievements of the UK Atomic Energy Authority during 1956-57 included the opening of the Calder Hall nuclear power station, the placing of contracts for two English nuclear power stations, provisional arrangements for the first Scottish station and a possible third English station, and the formation of the Nuclear Energy Trades Association Conference.

Details of these developments are given in the authority's third annual report (Stationery Office, price 3s).

Estimated expenditure approved by Parliament for 1956-57 was £68,242,000. An additional £3,735,000 was also approved in March, largely to meet increases in wages and salaries resulting from national wage awards. The sum required for 1957-58 is estimated at £98,769,000, an increase of £27,000,000. Constructional work is said to account for over £20,000,000 of this increase.

Research work carried out by the authority has included a study of practically all the radioactive heavy elements from polonium to cerium. Over 20 of the 30 polonium compounds now known have been prepared at Harwell. The metal occurs naturally in such small quantities that it had never been isolated in weighable amounts until the advent of the nuclear reactor enabled it to be made by irradiating bismuth.

Uranium dioxide, which is non-stoichiometric, is bejng studied. The amount of oxygen uptake under varying conditions is of great technological importance.

Chemical analysis by neutron activation is being jnvestigated in many laboratories, but the Harwell work is described as 'outstanding'. A sample containing minute traces of the element to be determined is irradiated with neutrons. At the same time a standard containing a known amount of the same element js irradiated. The unknown is determined by comparing radioactivities.

The method is claimed to be extremely sensitive and has been used to determine one part in 10 million of copper in silicon.

At Harwell research is continuing into ways of obtaining power from controlled thermonuclear or fusion reactions. The object js to heat isotopes of hydrogen to temperatures in the region of 100,000,000°C at which the nuclei fuse to form heavier nuclei, releasing energy in the process. Problems to be solved include heating the hydrogen to the required temperature and of isolating the hot gas from the walls of its container and maintaining it at a temperature long enough for the heat energy released in fusion to exceed that needed to heat the fuel.

BR Introduce New High Speed Tank Wagons

THREE prototype tank wagons were demonstrated last week at Marylebone Station, London. Designed for carrying bulk liquids at high speeds, the wagons are fitted with vacuum brakes, pneumatic buffers and roller bearings. They are designed to meet the requirements of British Railways' £1,200 million modernisation programme.

The type 'A' wagon is suitable for the conveyance of inflammable liquids of a flash point lower than 73°F. The type 'B' vehicle, designed for the conveyance of heavy liquids and chemicals, has steam heating coils, and is arranged for bottom discharge on either side. A creosote tank wagon, for British Railways' service requirements, fitted with steam coils and bottom outlet discharge was also shown.

Grants for Science Students in US

THE English Speaking Union of the United States is to award up to 30 fellowships to British science and technical students to study in American universities during the academic year 1958–59. To qualify for consideration, candidates must be between 18 and 30, single, and either

(a) Holders of a British university degree, or candidates for a degree in the summer of 1958, or

(b) Holders of a Higher National Certificate, or candidates for the Certificate in the summer of 1958.

The stipend of each fellowship is to be $2,500, plus the cost of tuition and travel to the US. When enquiring about the awards, students are asked to state the qualifications they have or expect to take, the university or college at which they have studied, their proposed field of study in the US, and their date of birth, nationality, and marital status.

Application forms can be obtained from Mrs. D. R. Dalton, King George VI Memorial Fellowship Committee, 37 Charles Street, Berkeley Square, London W1. Applications must be in by 16 November 1957.

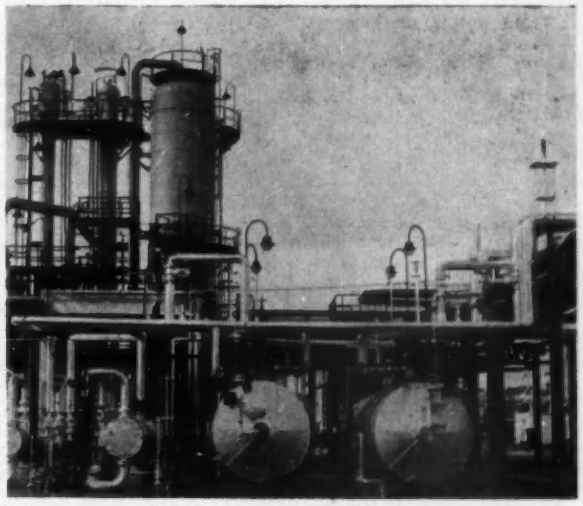
Foundation to Sponsor Scientific Research

ESTABLISHMENT of a Squibb Foundation which will sponsor scientific research and study has been announced by Sir Roland Robinson, chairman of Squibb Ltd.

The foundation, to be a charitable organisation, will finance symposia and co-operate in study of medical and scientific subjects, publish reports and support scientific research, co-operate in industrial and pharmaceutical education and support post-graduate work in selected pharmaceutical and scientific areas.

Need for any of these subjects will determine amounts to be allocated.

First Lacq Unit Has Daily Sulphur Capacity of 200 Tons



The desulphurisation unit at Lacq. By courtesy of the Societe Nationale des Petroles d'Aquitaine

THE high content of hydrogen sulphide in Lacq gas—about 15 per cent—makes the possibility of sulphur recovery worthwhile. The first unit at Lacq will treat the hydrogen sulphide contained in one million cubic metres of crude gas each day, resulting in a daily output of 200 tons of sulphur. (Some details of the plant at Lacq, France, were given in CHEMICAL AGE, 22 June, 1947).

Three other units are under construction and will be in operation in 1958. These will be capable of treating four million cubic metres of the gas. By 1959, progressive expansion is expected to raise treatment capacity to 10 million cubic metres a day and some 26 million cubic metres by the end of 1962. This will mean that Lacq, in 1959, will produce 300,000 tons of sulphur, and with increasing capacity, will reach 1,200,000 tons at the end of 1962. France is thus expected to become the second largest sulphur producer after the US and to equal Mexico's output.

Export Surplus

After satisfying French industrial requirements which are estimated, at present, at 400,000 tons annually of elementary sulphur there will be an exportable surplus of about 800,000 tons.

The principle of the process employed in obtaining sulphur is a modified Claus process. Hydrogen sulphide is partially oxidised to sulphur by air in the presence of a catalyst. The essential modifications introduced are concerned with the recovery of the heat of reaction, the augmentation of conversion by utilising more stages of catalysis with intermediate condensation of sulphur and careful control of the ratio of hydrogen sulphide to air.

The complete reaction is expressed as follows:

$$3H_2S+3/2O_2 \rightleftarrows 3/2S_2+3H_2O \qquad (1)$$

The sulphur produced is normally the result of two successive reactions:

$$H_2S+3/2O_2 \rightarrow SO_2+H_2O \qquad (2)$$

oxidation by air of the H_2S present with the sulphur dioxide then gives

$$2H_2S+SO_2 \rightleftarrows 3/2S_2+2H_2O \qquad (3)$$

In the sulphur recovery unit at Lacq, acid gas composed of hydrogen sulphide (57 per cent) carbon dioxide (37.5 per cent) hydrocarbons (1 per cent) and water (4.5 per cent) is washed with an aqueous solution of diethanolamine which selectively absorbs most of the two gases. The remaining amounts of the gases are removed when the gas is pumped through an aqueous solution of caustic soda. Steaming removes the diethanolamine from the hydrogen sulphate and carbon dioxide and is thereby reactivated for further use.

The gas composed of hydrogen sulphide, 66 per cent and carbon dioxide 34 per cent, is burned in a special furnace, comprising a combustion chamber, three combustion tubes, an intermediate chamber, a convector (un faisceau de connecteur) and an exit chamber. Calculated temperatures are 1,400°C. in the burners, 1,100°C. in the combustion chamber, 850°C. in the intermediate chamber. Without its refractory fitments the furnace weighs 106 tons.

Air for combustion is furnished by a turbo-blower using the vapour produced by its own heat.

The condenser is of the tubular type. Sulphur is recovered in the lower chamber. The water level is regulated and allows adjustment of the temperature of the exit gases.

Catalytic convectors contain the catalyst bed placed on a steel grill. The catalyst employed is an activated bauxite composed of:

Al_2O_3	88–92 per cent
Fe_2O_3	1–2 per cent
SiO_2	6–7, 5 per cent
TiO_2	2–3 per cent

in granules of about 6–12 mm.

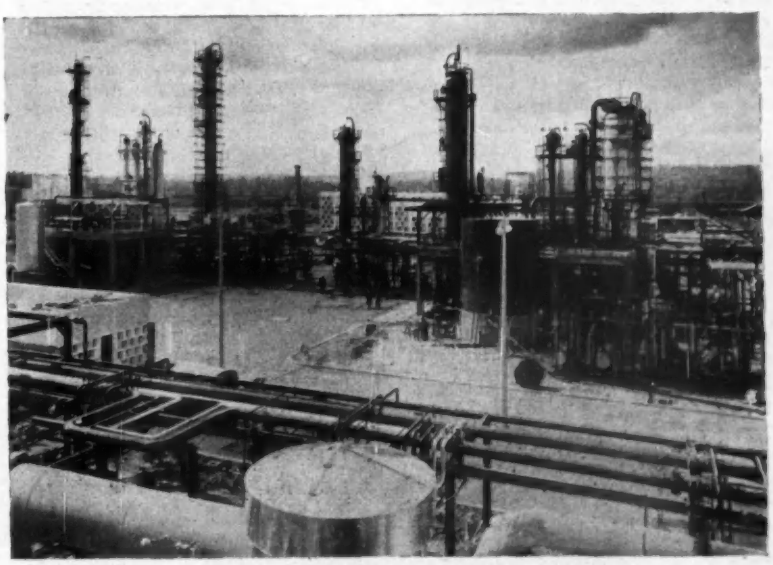
Duration of service of a charge is normally quite long—three years or thereabouts without regeneration being necessary. Deterioration is usually provoked by deposits on the catalyser, due to carbon from heavy carbons remaining in the acid gas, or is due to sulphur if the temperature of the gas falls in the course of the reaction. The catalyst can be partially regenerated by burning off the deposits.

After each stage of catalysis, the sulphur produced is condensed in a vertical tubular condenser. The condenser installed after the first catalytic chamber functions as a generator of low pressure vapour, while that after the second chamber is used to preheat the circulating water for the furnace and other condensers.

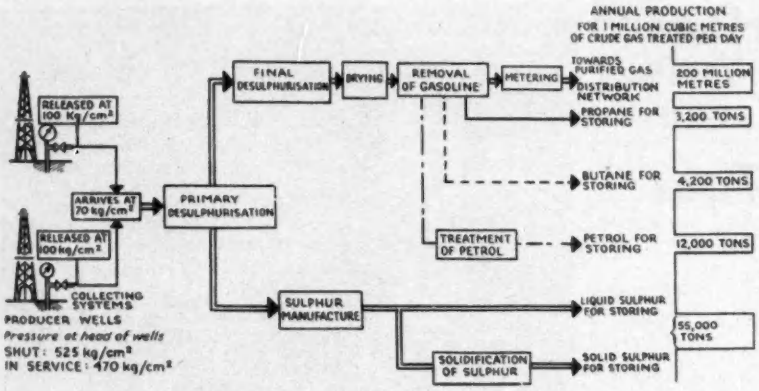
Sulphur still remaining in the gas leaving the last condenser is recovered in a coalescer where the disperse liquid phase is separated.

Gases leaving the coalescer pass to an incinerator where in the presence of excess air, hydrogen sulphide and residual sulphur compounds are oxidised to sulphur dioxide.

The exhaust chimney for the waste gases is over 150 ft. high. It is of a non-



Desulphurisation and degasoltnage units at the Lacq plant



Scheme of installations at Lacq sulphur plant

corrodible metal. The upper part, which is exposed to corrosion, is formed of unoxidisable steel.

After two stages of catalysis, sulphur recovery is about 94 to 95 per cent. The liquid sulphur is collected from the furnace, condensers and coalescer first in a pit of 400 tons capacity supplied with a heat coil from whence it is pumped to vats for storage.

Sulphur of a very high purity is obtained. Analysis of the output has shown the following results: sulphur, 99.94 per cent; bitumen, 0.01 per cent; ash, 0.01 per cent and moisture 0.04 per cent.

New Benzole Refining Exhibit for Science Museum

BENZOLE refining is the subject of a new exhibit in the industrial chemistry gallery of the Science Museum, South Kensington, London. Sponsored by the National Benzole Association, it was formally presented to the Museum on Monday.

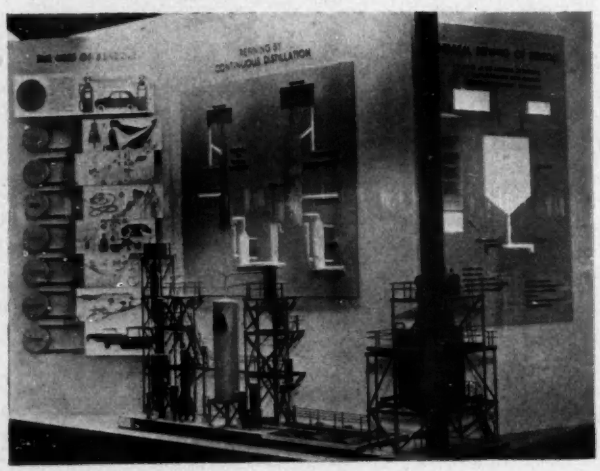
The exhibit occupies an island show-case near the displays of the tar and petroleum industries, so that together the three exhibits feature the principal sources of raw materials for the chemical industry. The benzole showcase comprises six panels, three of them animated and four models, which show the origin, history, refining and uses of benzole. Crude benzole extraction is not shown as it is dealt with in the gas gallery.

A model of a continuous-distillation unit consists of two columns from which are obtained forerunnings, benzene and toluene fractions and a residue. Chemical refining of benzene is represented by a washer showing the sequence of operations. The third model is of a batch still. Where possible the models have been cut away to show the inside of the plant.

A static panel represents the uses of benzene in motor spirit and its increasing importance as a raw material for the chemical industry, including the production of synthetic fibres, plastics, insecticides, lacquers and explosives.

Education of Physicists

The proceedings of a conference on degree and diploma courses in applied physics held in November 1956 at the Institute of Electrical Engineers, London WC2, have been issued. Entitled 'The Education of Physicists in Universities and Colleges of Technology', the 73-page book is published by the Institute of Physics, London, at a price of six shillings.



This section of the exhibit shows distillation (centre) and chemical refining of benzole. The animated panels behind the models are worked by push button.

Screened Indicator for Thorium Titration

TO AVOID the indefiniteness in the end-point of the complexometric titration of thorium using alizarin S, as indicator, M. R. Verma and S. D. Paul of the Division of Analytical Chemistry, N.P.L. New Delhi (*Current Science*, 1957, **26**, 178) investigated the value of a screened indicator.

To an aliquot of EDTA solution, 10 ml. of monochloroacetic acid—sodium acetate buffer, 1.5 ml. of alizarin S (0.1 per cent) was added and this titrated against the thorium solution. The titre so obtained was compared with those to which one, two or three drops (0.05 ml., 0.1 ml. or 0.15 ml.) of 0.1 per cent solution of xylene cyanole FF had been added as the screening agent to the main solution. The colour change is stated to be from green to pink violet through grey. When thorium of molar strength M/20 or M/100 was titrated, three drops (0.15 ml.) of xylene cyanole FF was adequate to effect a very sharp change in colour.

It is claimed that with more dilute solutions, e.g., M/1,000, for every 1.5 ml. of alizarin S solution one to two drops (0.05 ml. to 0.1 ml.) of the screening dye gave the most conspicuous and consistent colour changes. The investigators therefore conclude that a mixture of alizarin S (0.1 per cent to 1.5 ml.) and xylene cyanole FF (0.1 per cent to 0.15 ml. or less) is a better indicator for a complexometric titration of thorium than alizarin S alone. The production of a grey tone from green marks the approaching end-point, which extends over one or two drops of titrant only.

New Dye Machine has 12,500 Gall. Capacity

ONE OF THE main features of what is claimed to be the world's largest hank-dyeing machine which, incorporating more than 20 tons of stainless steel, has been put into operation at the mills of the Birstall Carpet Co. Ltd., Birstall, is the high rate of efficiency with which dye liquor is mixed and distributed. It is said that this machine can dye 9,000 lb. of carpet yarn in a single operation and that its total liquor capacity is 12,500 galls.

Dye liquor is drawn simultaneously from four tanks to a central mixing point, thoroughly mixed and distributed back to the individual tanks as quickly as possible to ensure that there is no perceptible difference in the dye content of the tanks. To eliminate any variations in the quantity of yarn in the tanks, or in the rate of temperature rise, which could result in lack of shade uniformity, the Longclose Engineering Co. has installed a particularly large mixer. Temperature control for all four vats is by a DV 3 dye-vat controller designed by the Drayton Regulator and Instrument Co. Ltd.

Heating for the plant is by closed coil indirect steam heating. Large quantities of low pressure pass-out steam from the mill's turbines were utilised for this and some 1,300 ft. of solid drawn stainless-steel steam pipe, 12 in. in diameter, was specially made for the purpose. The pipe was made from steel supplied by Firth-Vickers Stainless Steels Ltd.

Three Chemistry Sections of Paris Congress Reviewed

THE introductory lecture by Professor Natta, at the Sixteenth International Congress of Pure and Applied Chemistry held in Paris, set the tone for a large number of the papers which were presented in the division of organic chemistry, writes our special correspondent who attended the congress. Stereochemistry and orientation phenomena and allied selective reactions together comprised one of the major groups into which organic chemistry was divided. Closely allied with this was the section on organo-metallic compounds which included studies on organo-metallic intermediates formed during catalytic reactions.

Organic chemists have of recent years been making a much closer study of reaction mechanism and intermolecular rearrangements which was discussed in the principal lecture by Professor V. Prelog of Zurich. These reactions can be split into two main groups, based on free radical or ionic mechanism, and in fact one of the major papers, by Professor Paul D. Bartlett, dealt with the initiation of organic chain reactions.

A further group of the papers on organic chemistry was based on recent developments into the structure and synthesis of natural products. The two main lectures here were by Professor Tetsuo Nozoe on the chemistry of tropolones, and by Professor L. Marion, of Ottawa, on the structure of some delphinium alkaloids. Professor E. R. H. Jones reviewed the chemistry of natural polyacetylenes.

Chemistry of Boron

Developments in the chemistry of boron in recent years have been spectacular and this relatively common element is the basis of a series of preparations based on compounds with hydrogen which have bridged the gap between conventional organic and inorganic chemistry. These new compounds were the subject of a comprehensive review by Professor Egon Wiberg which is dealt with elsewhere in this issue.

Recent advances in the chemistry of organic boron compounds was the subject of a lecture by Dr. M. F. Lappert, of the Northern Polytechnic, London, who published an extensive review recently. (Lappert, *Chem. Rev.*, 1956, **56**, 959.) About 30 further papers have been published since then, half of which have come from the Northern Polytechnic.

New compounds include amines with direct boron-nitrogen linkages, new esters and hydroxides; new heterocyclic systems, and products formed by the reaction of boron trifluoride with organic compounds such as cyclic ethers, nitriles and esters, boron-carbon cleavage reactions, and organo-boron polymers.

Principal inorganic themes were the study of chemical reactions at high temperatures, of which the major lecture was by Professor Leo Brewer, of the University of California; and chemical properties of the elements of the actinium series. The principal lecture on the latter subject was by Professor A. G. Maddock, of Cambridge, and was entitled 'Protoactinium and related elements'. There are indications that protoactinium should prove to be a normal transition element, a homologue of tantalum. The complexity of the oxide system bears a resemblance to the uranium—oxygen system. In solution the element displays its relation to niobium and tantalum.

The themes of the physical chemistry section were less clearly defined, but groups of papers were devoted to the physical chemistry of the radioactive elements, combustion of gaseous mixtures, water in chemical compounds, and diffusion in liquids and gels.

New Battersea Courses in Crystallography

POST-GRADUATE courses in crystallography, leading to examinations for the degree of M.Sc. of London University, or the post-graduate diploma of the Battersea College of Technology will be held in the college metallurgy department, starting in September. Minimum duration will be one session for full-time students, or two sessions for part-time students.

The courses will cover a general syllabus in X-ray crystallography with an emphasis on applications in metallurgy and includes symmetry theory, stereographic projection, theory of X-ray diffraction methods, crystal physics and optics, crystal chemistry, structure analysis and crystallography of metals. Advanced topics will cover electron and neutron diffraction. Practical work includes use of X-ray generators and diffraction cameras, the polarising microscope, etc.

Applications should be made to the head of the college metallurgy department at Battersea Park Road, London SW11.

Natta Considers New Polymer Developments at Paris

A MAIN item of the congress programme was a lecture by Professor Giulio Natta, director of the Institute of Industrial Chemistry of the Milan Polytechnic, entitled 'Stereospecific and stereoisomeric polymers, preparation of fibres, plastic materials and new elastomers'.

Professor Natta illustrated diagrammatically the differences between 'atactic' polymers which are the normal polymers with a random arrangement of molecules, isotactic polymers in which all groups on the main chain have the same spatial configuration, and syndotactic polymers in which some of the groups might be mirror images of each other. It had only been possible to obtain these stereospecific polymers since 1954.

It was stated by the Professor that his interest in processes of industrial catalysis was first aroused by a study of catalysts used in making methanol on a large scale. The work on the Ziegler type catalysts led to X-ray studies of the crystalline nature of the polymers formed, and his own work on catalysts. It had been shown by X-ray crystallography that the repeating units in the isotactic polymer crystals were almost all identical, depending on the nature of the monomer, and that the giant molecule in many cases could be considered as two helices in the same crystal. It was also observed that isotactic polystyrene had a much higher melting point than the normal material, about 230–240 °C., whilst ortho-substituted polymers had melting points over 300 °C. An interesting property of isotactic polymers was that they could be utilised as fibres because of their crystallinity. According to Natta polyisoprene will attain considerable industrial importance in this capacity. Dyeing problems associated with the fibre had now been overcome. The fibres were produced by extrusion, and a number of slides were shown of textile products made with this crystalline polyisopropylene.

Rubber-like products which bear a much closer resemblance than do the normal GR-S types to the natural product could be produced by the aid of the isotactic type catalysts, said Professor Natta. This was because natural rubber crystallised on stretching. It was necessary, therefore, to obtain a synthetic product with a controlled irregularity in the molecule. A small percentage differed from the rest in not reacting by 1:4 addition, and several organisations in the US had now prepared a polyisoprene (Goodrich, Firestone) which was almost identical with natural rubber. It was interesting to note, said the Professor, that all four possible stereoisomerides from butadiene had now been synthesised.

In order to obtain resins with normal plastic properties, certain specific conditions were necessary. Thus, there should be some disorientation in the molecule, the chains should be reasonably flexible, and strongly polar groups should be absent. A useful feature of isotactic polymers in the plastic range was that the objectionable tendency to creep was absent.

Professor Natta next discussed the nature of the reaction with the catalyst and indicated the probable function of the directional linkage. He also reported that the stereospecific process was now considered to react by an ionic mechanism.

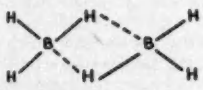
During the conference a paper was given by Natta and his co-workers entitled 'Crystallisable organo-metallic complexes containing titanium and aluminium'. In this it was stated crystallisable complexes containing titanium, aluminium and organo-metallic compounds had been obtained by reacting triethyl aluminium with halogen-containing titanium compounds. Thus,

by reacting triethyl-aluminium with dicyclopentadienyltitanium dichloride, a complex containing Ti, Al, and Cl, C_2H_5 groups has been obtained in good yield. The complex was crystallised from n-heptane, in the form of green needles, melting point 121–124°C., which were decomposed, however, by traces of oxygen or active hydrogen compounds. The ratio of Ti, Al, Cl was stated to be 1:1:2 and the compound might be $(C_2H_5)_2TiAlCl_2(C_2H_5)_2$. This type of complex had catalytic activity in the polymerisation of unsaturated hydrocarbons.

A further paper by Natta and his co-workers discussed chain termination in stereospecific polymerisations. From this it was noted that systematic kinetic studies were undertaken. The results obtained suggested that chain transfer by the monomer played a principal part.

Wiberg on Developments in Boron Chemistry

Professor Egon Wiberg, director of Institute of Organic Chemistry, Munich University, considered the 'Development of boron chemistry within the last decade'. He said that although boron was discovered by Gay Lussac and Thenard in 1808, it was only recently that there had been a comprehensive development of its chemistry. The fundamental basis of organic boron chemistry was the idea of resonance bonds which could be indicated thus:

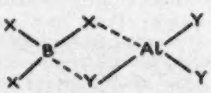


This compound has hydrogen anion bridges.

Many boron compounds were isoelectronic with those of carbon. Whilst B_2H_4 could exist it could form the compound $BH_3—B_2H_4—BH_3$ by means of a bridge structure.

On the other hand boron trifluoride (BF_3) was isosteric with COF_2 and the molecule was planar.

Boron hydrides reacted with elements in groups 1 to 3 of the periodic table by means of bridge bonds, said Professor Wiberg. Thus compounds of the general formula:

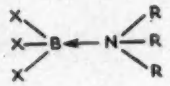


involving bridge bonds might be formed.

Double hydrides were known, especially those of the general formula $Me(Al(BH_4)_4)_n$, where Me = metal of 1st to 3rd groups and n = 1, 2, or 3.

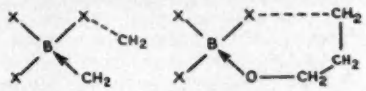
These latter compounds had an extremely high hydrogen content. Since the heat of combustion of a boron hydride was about double that of the corresponding carbon compound on a weight basis (including oxygen required for combustion) these complex hydrides had an application in rocket fuels, as well as in the more conventional use of strong reducing agents.

Reactions of boron hydrides with the fifth to seventh groups of the periodic table involved co-ordinate bonds. Of great interest, stated the Professor, was a series of compounds with the basic formula:



which had a remarkable analogy with the corresponding isoelectric carbon compounds. These included borazanes, $BX_3 \leftarrow NR_3$ and borazines, $BX \leftarrow NR_3$. Similar series of compounds containing oxygen included: boroxanes, $BR_3 \leftarrow OR_2$; boroxenes, $BX_2—OR$, and boroxines, $BX=O$. It was to be noted that the borazanes were isoelectric with ethanes, and boroxane with methylamine, the remaining boron derivatives corresponding to the unsaturated organic compounds.

Carbon compounds could react with boron compounds by both bridge and co-ordinate bonds to give compounds such as:



In all above X = H, F, OR, NR_2, or CR_3.

Initiation of Organic Chain Reactions

In considering initiation of organic chain reactions, Professor Paul D. Bartlett, of Harvard University, Cambridge, Massachusetts, remarked that there was an optimum stability of a radical with respect to its power to initiate chemical reactions such as polymerisation of vinyl monomers. Thus the triphenyl-methyl radical was too stable to initiate polymerisation of monomers such as vinyl acetate.

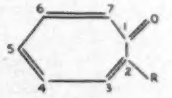
On the other hand, said Professor Bartlett, initiators such as benzoyl peroxide, which in general decomposed above 60°C. to yield free radicals did so by cleavage of the labile 0-0 bond. In the alternative well-known series of free radical initiators, such as those based on azo-diisobutyronitrile, there was simultaneous cleavage at two bonds which was assisted by the formation of a very stable molecule, nitrogen. In spite of statements previously made, carbon dioxide was not formed by the decomposition of benzoyl peroxide into radicals.

The Professor reported that a series of tertiary-butyl peresters had been examined with a view to determining whether carbon dioxide is formed during the formation of free radicals by decomposition. It was concluded that a series of short-lived organic radicals had stabilisation energies in the following increasing order: benzyl; trichlormethyl; *t*-butyl; benzhydryl; cumyl; alpha-methyl benzhydryl; alpha-phenylallyl.

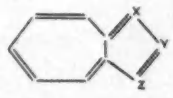
According to the speaker, some new initiators were being examined that gave rapid simultaneous rupture at three bonds. Homogeneous polymerisations could thus be initiated at or below room temperature.

Chemistry of Natural Tropolones

'Chemistry of natural tropolones and allied compounds' was discussed by Professor Tetsuo Nozoe, Sendai, Japan, who said that researches had been conducted on this unusual type of compound since 1940. The compounds were based on a seven-membered ring allied to the aromatic series. Closely related is the twelve-member azulene ring which consisted of a fused seven- and five-member ring.

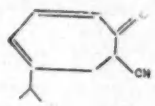


Tropolone: R = H in simplest case.

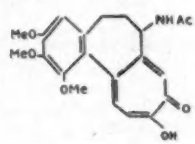


Azulene X, Y Z substituents

Since this type of structure was first suggested by Dewar in 1945 for the colchiceine alkaloids, about 20 natural compounds had been found which possessed a seven-membered ring structure. Thujaplicine (below) had been found in cedar wood, and



its constitution had been established utilising paper chromatography. Colchiceine, a typical member of the alkaloid series, had the formula:



Professor Nozoe stated that the tropolone ring had a marked tendency to function as a cation, and it could be reduced to a completely saturated ring by hydrazine or hydroxylamine.

Substitution by anionoid groups such as –CN, gave compounds of a marked polar character. These derivatives often rearranged to the corresponding benzenoid structures with a methyl side chain. Condensation of tropolone with ethyl malonate, ethyl cyano-acetate, and guanidine gave azulene derivatives.

Less Acidic Catalyst

It was more difficult, said Professor Nozoe, to perform a Friedel Craft reaction with tropolones and azulenes than with benzenoid compounds. It was necessary to use a less acidic catalyst for this and other substitution reactions. Thus, tropolone could not be sulphonated with concentrated sulphuric acid, but sulphamic acid could be used for sulphonation, giving a 3–, 5–, 7–, derivative.

The properties of some of the simpler azulene compounds were also discussed. It was stated that if X in formula above was COOEthyl, Y was NH_2, and Z was COOEthyl the product was an orange-coloured crystalline solid, melting point 49°C.

Diazoacetic ester could be used as a method of synthesis of azulenes from tropolone according to the Professor. Colchiceine, although its formula had been established, had not yet been synthesised.

Overseas News

SARDINIAN AUTHORITIES FORM COMPANY FOR URANIUM PROSPECTING

PLANS for future local activities in Sardinia have been announced by the Sardinian authorities.

The local government is to undertake prospecting for hydrocarbons and radioactive minerals. For this purpose, *Societa' per Azioni Idrocarburi Sardegna* (SAIS) has been constituted. This company will investigate an area totalling 9,000 square kilometres. It is believed that petroleum may be found in the western part of the island, beyond an imaginary straight line running from the mouth of the River Coghinas to the bay of Cagliari.

Prospecting is expected to last five years and costs would be borne by SAIS which would have priority as regards concessions in the case of discovery of petroleum. Royalties will be paid by the company in accordance with a progressively increasing scale.

Prospecting for radioactive minerals will be carried out by SOMIREM, a company affiliated with Agip Mineraria which will study areas totalling 12,000 square kilometres in the central, south-western and north-eastern parts of the island.

So far, six applications have been made for permits to build petroleum refineries in Sardinia. The points indicated are: Cagliari, Oristano, Porto Torres, Golfo Aranci, and S. Giusta.

Sardinia Government has at its disposal a fund of two milliard lire with which to encourage the industrialisation of the island. This sum is stated to be quite inadequate for it is estimated that industrial schemes planned at Cagliari, Sassari, Porto Torres, Macomer, Oristano, Sant'Antioco and Portovesme would require about 30 milliard lire. It is hoped, however, that private capital will be attracted by the new Sardinian law which authorises the issue of bearer shares when the industrialisation of Sardinia is involved.

Fertilisers Enquiry

Éste Asiático, Comércio e Navegação Ltda., Caixa Postal 2638, Porto Alegre, Brazil, are interested in receiving offers from UK suppliers of fertiliser chemicals. They are also interested in ready-mixed fertilisers.

Aluminium Sulphate Plant Planned for Ontario

The Buch Nichols Co. Ltd., have announced plans to build the first plant in western Ontario for the manufacture of liquid aluminium sulphate. The plant, which will be located at Port Arthur, Ontario, is expected to be in operation this autumn.

According to Dr. E. P. Aikman, Nichols' vice-president and general manager, the decision to build the plant in the Lakehead region reflects increased industrial development in the area. Primarily, the plant will serve paper mills in and around Port Arthur and Fort William which are large consumers of this chemical.

Nichols now has major production works at Valleyfield, Quebec; Sulphide and Thorold, Ontario, and at Vancouver, BC.

Battelle Institute's New Method of Testing Titanium Alloys

Investigators of the Battelle Institute, Columbus, Ohio, US, have developed a new micro impact testing method for toughness of experimental samples of titanium. Less than 15 per cent of the material used for conventional toughness tests involving the use of Charpy V-notch specimens is said to be required. Successful detailed examination of the toughness of titanium alloys machined from ¼-inch diameter rod stock and for studies of weld zones in ¼-inch plates is reported. Comparative experiments are stated to have given results similar to results obtained with the Charpy V-notch test.

Portugal Plans New Fertiliser Capacity

The Portuguese Government has allotted 135 million escudos for the production of nitro-ammoniacal fertilisers. Two factories will be working by 1959 to produce 80,000 tons a year of nitrogenous fertilisers, as well as supplying gas for domestic use in Lisbon. The Uniao Fabril de Azoto, Avenida da Liberdade 42, Lisbon, in its annual report for 1956 stresses the need for the setting up of ammonium nitrate manufacture if the Portuguese market for fertilisers is to be satisfied by home production. Output in Portugal of fertilisers in 1956 totalled 104,000 tons; consumption was double that figure.

US Interest in Liberia

Columbia Southern Chemicals Co. of the US, who have obtained a mineral concession in Liberia, have set up a laboratory near Monrovia where geologists are testing specimens of ores.

The company is interested in ores used in the production of titanium and has been negotiating for a similar concession in Sierra Leone.

Australian Lignin Plant now operating at Maryvale

Production has begun at Australia's first lignin extraction plant at Maryvale. The plant will produce about 1 ton of powdered lignin per day.

Previously the only use of lignin has been in the paper industry as a fuel to assist in the recovery of chemicals from the black liquor. About 120 tons are estimated to be burnt daily at Maryvale.

Lignin is produced at the Maryvale plant by the Tomlinson process. A small proportion of the black liquor passing to the recovery furnaces is drawn off the evaporator to a carbonating tower and there acidified by flue gases. This precipitates part of the lignin. The resultant liquid is then pumped through a steam heater which melts the lignin, then to a separator where the lignin 'tar' settles to the bottom and flows to a receiver.

Lignin 'tar', still in the form of a sodium salt, is then subjected to a second precipitation process with hot, dilute sulphuric acid, which gives a complete and rapid precipitation of pure lignin. The lignin is then washed, filtered, dried and packed.

Australian Paper Manufacturers Ltd., arp stated to have received many enquiries from manufacturing concerns and associations interested in the possible uses of lignin in their own fields. These include fertiliser works, rubber manufacturers, brick and pottery works and rubber research associations.

Hoechst Link with French Firm

Polysynthase SA has been jointly set up in Paris with a share capital of Frs. 60 million by Farbwerke Hoechst AG., Frankfurt and the Société Centrale de Dynamite (one of the Nobel group) to produce polyvinyl acetate dispersions, other chemical products and pharmaceuticals.

Japan may Cut Chemical Industry Investments

According to an announcement by Japan's Ministry of Finance, an advisory organisation of the Japanese Government, the Council on Credit Supply, has recommended that this year's capital investments for the synthetic chemical industries should be cut by 10 per cent. The recommendations, which will be submitted for approval to the Japanese Cabinet, would delay the setting up of a large percentage of plans for building new plants for petrochemicals, synthetic resin, synthetic fibre and other synthetic chemical industries. A sum of 74,800 million yen had been provided.

Italy Exports Sulphuric Acid to Turkey

About 700 tons of concentrated sulphuric acid produced by Bombrini Parodi-Delfino of Colleferro (Latium) have recently been shipped to Turkey. This is understood to be the first of a series of similar shipments.

New Hydrazine Derivatives by Olin Mathieson

Among new products introduced by the Olin Mathieson Chemical Corporation, are three hydrazine derivatives—hydrazine dihydrochloride, hydrazo-dicarbonamide and monohydrazinium phosphate. These are available in laboratory quantities from the industrial chemicals division, at Baltimore, Ma.

Hydrazine dihydrochloride, soluble in cold water and insoluble in hot absolute alcohol, has a melting point of 198°C. and undergoes many of the reactions of hydrazine and hydrazine salts. It is used as a chlorine scavenger for hydrochloric acid gas streams and as an ingredient in copper

cleaners and aluminium soldering fluxes.

Hydrazo-dicarbonamide (biurea) has a melting point of 256° to 258°C., it is soluble in water, strong bases and strong hydrochloric acid, and insoluble in alcohol and diethyl ether. Applications suggested are as a chemical intermediate, as a base constituent for polyamide thermosetting resins, and as a growth regulating agent.

Monohydrazinium phosphate, melting point of 81° to 83°C., is soluble in water and insoluble in methanol, benzene and diethyl ether. Preliminary work indicates that it should be an excellent oxygen scavenger for the treatment of boiler feedwater. The product also shows promise as a chemical intermediate. The hydrazine portion of monohydrazinium phosphate will react in the same manner as the hydrazine portion of any other hydrazine salt.

US Firm Seeks Exchange of Technical Information

Mr. Elliott Wentworth, secretary and treasurer of Vulcan-Cincinnati Inc., 120 Sycamore Street, Cincinnati 2, Ohio, who will be in the UK from 7 to 16 August, would like to visit the principals of a UK chemical process engineering company. He wants to discuss the possibility of entering into an agreement for the exchange of technical information and processes for the purpose of possible expansion of common marketing in the US and the Commonwealth. Vulcan-Cincinnati Inc. are old-established manufacturers of plant and equipment for the chemical, petrochemical and process industries. Mr. Wentworth can be contacted, care of the BoT Export Services Branch, Room 746, Lacon House, Theobalds Road, London WC1.

Further Developments in the Lacq Area

Plants to produce acetylene, methanol and ammonia based on the large natural gas deposits in the Lacq district, of south-west France, are being considered by the Société des Produits Chimiques d'Aquitaine, a joint affiliate of the French Government's Office National Industrial de l'Azote.

New Acetylene-Base Plant for Dow Chemicals

Acrylonitrile will be among the first of the new chemicals made by the Dow Chemical Co. of the US, to originate from acetylene. A new plant for acrylonitrile, construction of which will start at Freeport, Texas, early next year, will come on stream in the first quarter of 1959.

Large New Polythene Plant for Chemische Werke Hüls

The synthetic rubber plant of Chemische Werke Hüls AG at Marl, near Recklinghausen, is expected to start production in the early summer of 1958, states the company. A large number of new installations has been opened, including plant for the production of acetylene, p.v.c. suspension, ethylene oxide, tetrapropylene benzene, and trichloroethylene. Production of low-pressure polythene has enabled the company to extend its output of plastics materials; the current demand is thought to justify the erection of a large-scale polythene plant, and this is now being designed. The company's research workers have been set the task of examining whether and to what extent intermediates at present made from an acetylene basis can be produced on olefine basis.

Chemische Werke Hüls AG last year increased its total sales to DM 477.4 (1955: 427.5) million to which exports contributed DM 171.4 (141.5) million. Capital expenditure on new plant and extensions was almost unchanged at DM 73.2 million. Wages and salaries rose by 18 per cent while sales increased by 12 per cent.

Gulf Oil Enter Benzene Field with Large Plant

Construction, at their Port Arthur, Texas, refinery of a large benzene plant capable of producing about 30 million gallons a year, will bring Gulf Oil Corporation, Pittsburgh, into the benzene field. This plant, scheduled for completion late next year, will make Gulf Oil one of the leading suppliers of this material. Feedstocks will be drawn from Port Arthur refinery streams. The plant is also expected to produce substantial amounts of toluenes.

African Explosives to Extend Ammonia Output

A large expansion of nitrogen manufacturing capacity at Modderfontein, near Johannesburg, is being started by African Explosives and Chemical Industries. The scheme includes extension of ammonia output by 70,000 tons a year and the installation of plant to convert nearly the whole of this extra output into about 110,000 tons a year of urea. Cost of the project is estimated at £10 million and it is understood that capital will be provided mostly from local sources. The company hopes that the plant will come on stream during 1960.

Potassium Processing Plant Likely in Sicily

Construction of a new plant near Caltanisetta, in Sicily, for processing potassium salts is understood to be under consideration by an Italian Government committee. Cost of the plant is estimated at about 25 million lire.

First Polystyrene Plant for South East Asia

South East Asia's first polystyrene plant has started production at Bombay, India. The new plant, which took a year to construct, is owned by Polychem Ltd., formed in 1955 by Dow Chemical Co. of the US and Kilachand Devchand and Co. Ltd., an Indian company.

Technical know-how for producing Styron (Dow trademark for polystyrene) together with technical assistance in designing and equipping the plant was supplied by Dow who also provided training for Indians comprising the key operating personnel. The Indian public hold 50 per cent of the stock and Dow Chemical and Kilachand share the remaining stock.

OEEC Expect Slower Expansion Rate for Plastics Materials

SALES of plastics materials in OEEC member-countries in 1956 totalled the record figure of 1.2 million tons, 16 per cent higher than in 1955 and between three and four times the 1950 figure. The most rapid expansion during 1956 continued in the newer thermoplastics group where sales rose by 21 per cent over 1955 to nearly 600,000 tons. Production of thermosetting plastics rose rather more slowly by some 10 per cent to just under 500,000 tons.

Very rapid expansion is expected for certain plastics, particularly polythene, but in view of the high level of output already reached, total sales of plastics materials in West Europe will probably increase over the next few years at a less spectacular rate than in the first half of the 1950s. That is the conclusion of the plastics materials working party of the chemical products Committee of the Organisation for European Economic Co-operation, which met in Paris recently to review trends in plastics of sales and production.

SALES OF PLASTICS MATERIALS (METRIC TONS)

	Group 1		Group 2		Total (a)	
	1955	1956	1955	1956	1955	1956
Austria (a)	n.a.	n.a.	n.a.	n.a.	9,800	13,000
Belgium	3,600	2,650	12,800	15,250	16,600	18,100
Denmark	1,200	1,200	100	500	1,300	1,700
France	40,370	50,645	55,790	72,437	102,160	129,912
Germany	173,000	198,000	200,500	245,000	410,100	489,000
Ireland	—	—	—	—	76	66
Italy	35,405	38,446	84,048	99,120	124,897	144,283
Netherlands	18,397	21,577	4,867	10,689	25,970	34,781
Norway	7,207	7,026	1,760	2,300	9,004	9,366
Portugal	—	—	—	—	—	—
Sweden	20,000	22,600	5,700	6,300	31,500	35,800
Switzerland	n.a.	n.a.	n.a.	n.a.	15,400	19,000
UK	149,300	151,100	126,900	146,300	291,100	311,700
Total	448,479	493,244	492,465	597,896	1,037,907	1,206,708
United States	520,557	505,760	882,783	1,000,602	1,467,695	1,572,087

(a) Figures in this column include sales of cellulose derivatives and hardened casein, in addition to sales of group 1 and group 2 materials.
(b) Production figures.
Group 1 includes phenolic and aminoplastics, alkyds and most other thermosetting resins.
Group 2 includes polyethylene, polyvinyl chloride, polystyrene, acrylic and most other thermoplastics materials

UK Chemical Exports and Imports for First Six Months of 1957

EXPORTS

		QUANTITY		VALUE	
		Jan./June 1956	Jan./June 1957	Jan./June 1956	Jan./June 1957
INORGANIC				£	£
Acids	Cwt.	96,582	111,375	327,365	350,472
Copper sulphate	Tons	28,323	22,211	3,093,847	1,965,929
Sodium hydroxide	Cwt.	2,929,507	2,514,178	3,535,624	3,185,713
Sodium carbonate	,,	2,466,559	2,412,750	1,537,940	1,650,622
Aluminium oxide	Tons	10,116	15,452	323,810	522,817
Aluminium sulphate	,,	21,370	14,510	305,506	208,729
Other aluminium cpds.	,,	1,705	1,842	71,085	80,776
Ammonia	Cwt.	52,017	43,538	191,036	162,776
Ammonium cpds. (not fertilisers or bromide)	Tons	12,598	10,143	485,069	385,609
Arsenical compounds	,,	2,145	2,537	163,285	177,971
Bismuth compounds	Lb.	154,059	169,600	133,944	143,128
Bleaching powder	Cwt.	197,736	125,473	316,419	221,729
Hydrosulphite	,,	30,965	52,871	247,411	414,644
Other bleaching materials	,,	51,427	68,491	231,748	326,747
Calcium compounds	,,	169,517	176,677	349,565	355,810
Carbon blacks	,,	203,986	388,493	717,297	1,388,008
Cobalt compounds	,,	6,655	7,491	314,119	284,147
Iron oxides (chemically manufactured)	,,	47,041	48,240	157,561	147,353
Lead compounds	,,	23,207	23,227	157,818	149,536
Magnesium cpds. (nes)	Tons	6,946	8,437	358,409	419,589
Nickel salts	Cwt.	37,905	45,275	364,031	497,851
Potassium cpds. (not fertilisers or bromides)	,,	28,266	28,398	269,276	303,634
Sodium bicarbonate	,,	369,691	369,719	330,799	338,612
Sodium phosphates	,,	34,598	64,672	167,899	300,164
Sodium silicate	,,	202,761	162,914	178,287	146,758
Other sodium cpds.	,,	850,092	800,437	1,841,472	1,942,035
Tin oxide	,,	3,500	5,043	130,959	184,444
Zinc oxide	Tons	2,846	3,127	230,537	222,386
ORGANIC					
Acids, anhydrides and their salts and esters		—	—	693,833	629,488
Glycerine	Cwt.	34,955	54,438	384,959	503,353
Ethyl alcohol, methyl alcohol, etc., alcohols & mixtures (nes)		—	—	684,366	801,345
Acetone	Cwt.	98,880	75,926	240,572	238,439
Citric acid	,,	18,119	28,084	178,324	271,248
Gases, compressed, liquid or solid (nes)		—	—	518,513	1,060,543
Phenol	Cwt.	48,335	66,025	300,036	431,541
Salicylates	Lb.	388,368	612,838	105,774	185,437
Sodium compounds	Cwt.	14,298	15,321	154,662	199,956
Sulphonamides, not prepared	Lb.	860,298	640,183	437,943	446,196
Dyestuffs intermediates	Cwt.	39,375	52,266	718,291	761,594
Organic compounds (nes)		—	—	6,828,043	8,172,808
Total for elements & cpds.		—	—	**30,249,106**	**32,663,030**
Coal tar	Tons	62,205	47,055	546,436	488,195
Cresylic acid	Gall.	1,563,189	1,701,393	506,518	634,720
Benzol	,,	671,229	11,172	122,962	4,980
Creosote oil	,,	8,107,319	7,730,612	527,111	538,970
Other mineral tar & crude chems. from coal, petroleum & nat. gas	Cwt.	145,204	111,685	352,536	251,941
Pigment dyestuffs	,,	12,490	14,086	525,459	559,648
Other syn. dyestuffs & cpds.	,,	92,664	104,328	4,193,935	4,889,142
Synthetic org. pigments	,,	11,414	13,074	414,010	524,825
Veg. & animal dyeing extracts	,,	2,055	2,142	71,332	64,284
Tanning extracts	,,	59,038	76,945	264,144	343,993
Pigments, paints & varnishes		—	—	11,563,389	12,229,689
Drugs, medicines, etc.		—	—	17,813,623	19,827,442
FERTILISERS					
Ammonium nitrate	Tons	2,569	519	82,004	17,283
Ammonium sulphate	,,	17,530	31,600	339,542	566,506
Phosphatic and potassic		—	—	30,616	38,639
All manufactured fertilisers		—	—	229,712	232,638
Explosives		—	—	5,633,837	5,371,446
Insecticides, fungicides & rodenticides	Cwt.	203,598	191,170	2,245,815	2,374,026
Weedkillers	,,	54,802	63,643	640,089	666,313
Carbons, decolorising or activated	,,	44,049	42,343	189,426	177,265
Tetra-ethyl lead anti-knock compound	Gall.	2,368,606	2,792,515	5,038,450	6,097,436
PLASTICS MATERIALS					
Phenol & cresol formaldehyde resins	Cwt.	29,605	34,833	214,145	239,253
Urea formaldehyde resins	,,	132,754	116,083	631,415	587,649
Vinyl resins, unplasticised	,,	76,167	98,181	774,657	857,654
Vinyl resins, plasticised	,,	52,495	57,167	702,316	704,009
All other	,,	89,721	109,715	1,133,040	1,421,770
Moulding powders	,,	364,260	487,970	4,659,539	6,346,905
Sheet, rod, tube, film & foil	,,	143,690	147,496	4,368,499	4,360,418

IMPORTS

		QUANTITY		VALUE	
		Jan./June 1956	Jan./June 1957	Jan./June 1956	Jan./June 1957
INORGANIC				£	£
Acids	Cwt.	35,957	38,552	104,418	116,353
Abrasives, artificial—					
Aluminium oxide—					
Crude, unground	Tons	13,187	7,810	679,579	420,923
Ground or graded	,,	1,915	1,563	204,349	170,207
Silicon carbide	,,	7,393	4,375	736,435	437,996
Arsenic trioxide	,,	3,396	2,568	118,455	75,301
Borax, refined	Cwt.	230,719	257,134	433,342	511,378
Calcium carbide	,,	406,688	519,100	754,549	980,894
Carbon blacks (channel)	,,	86,351	97,952	495,823	571,853
Other carbon blacks (not acetylene black)	,,	52,058	37,650	201,431	143,323
Cobalt oxides	,,	6,300	3,591	394,123	224,579
Iodine	Lb.	281,115	660,354	141,492	254,371
Mercury	,,	529,123	760,238	593,486	844,733
Sodium, calcium, potassium, lithium	Cwt.	36,334	17,718	547,998	144,901
Potassium carbonate	,,	52,566	53,791	169,969	175,787
Other potassium cpds. (not fertilisers)	,,	37,283	53,607	178,996	241,616
Selenium	Lb.	97,355	87,157	537,597	449,581
Silicon	Tons	3,619	2,680	537,221	430,809
Sodium chlorate	Cwt.	58,669	66,010	179,078	222,521
Sodium phosphate	,,	16,648	2,070	76,841	13,576
Other sodium cpds.	,,	172,780	173,877	699,050	603,397
Inorganic chemicals (nes)		—	—	1,373,424	1,584,391
ORGANIC					
Acids, anhydrides and their salts and esters		—	—	833,370	913,596
Glycerine	Cwt.	56,181	65,738	434,207	406,918
Menthol	Lb.	38,505	96,704	77,732	203,601
Naphtha, methyl alcohol & alcohol mixture (nes)		—	—	1,285,992	1,308,085
Turpentine	Gall.	201,949	107,588	55,030	29,612
Glycol ethers & esters	Lb.	4,246,656	2,998,529	351,842	290,605
Sodium cpds.	Cwt.	63,809	77,397	622,914	765,962
Styrene (monomeric)	Gall.	1,773,246	380,465	972,231	203,606
Vinyl acetate (monomeric)	Tons	4,999	2,788	730,198	326,135
Dyestuffs intermediates	Cwt.	4,183	15,850	230,672	493,028
Organic cpds. (nes)		—	—	7,018,979	5,598,182
Dyeing extracts	Cwt.	9,555	9,979	68,176	74,937
Tanning extracts	,,	465,781	512,246	1,766,763	1,733,008
Vitamins, their salts & esters		—	—	822,642	545,833
Antibiotics		—	—	327,469	483,565
Alkaloids		—	—	530,278	349,601
FERTILISERS & OTHERS					
Basic slag	Tons	42,995	52,539	340,077	427,983
Potassium chloride	Cwt.	6,139,069	5,159,802	4,984,147	4,362,768
Potassium sulphate	,,	141,165	139,630	142,880	142,767
Other fertilisers		—	—	991,877	1,128,738
PLASTICS MATERIALS					
Vinyl resins	Cwt.	65,797	76,938	963,130	1,029,807
Other synthetic resins	,,	82,673	127,482	1,186,144	1,773,683
Moulding powders—					
Polystyrene	,,	2,407	4,082	31,266	54,770
All other	,,	15,009	21,284	265,877	336,621

EXPORTS OF CHEMICALS TO PRINCIPAL MARKETS

	Jan./June 1955	Jan./June 1956	Jan./June 1957
	£	£	£
Nigeria	2,295,324	2,787,742	2,528,121
Union of South Africa	5,833,449	6,419,079	6,277,222
Rhodesia and Nyasaland	1,060,384	1,155,431	1,487,376
India	7,449,110	9,721,012	10,208,340
Pakistan	2,109,020	1,825,756	1,598,028
Singapore	1,842,341	2,238,722	2,237,904
Malaya	1,542,920	1,863,315	1,930,987
Hong Kong	1,669,891	1,752,211	2,364,768
Australia	8,948,503	9,064,843	10,513,386
New Zealand	3,694,651	3,581,190	3,775,179
Canada	3,105,759	3,823,492	4,013,110
Jamaica	1,050,410	1,337,179	1,219,104
Irish Republic	3,446,382	3,554,316	3,295,496
Finland	1,508,469	1,583,586	1,363,702
Sweden	2,993,339	3,155,285	3,822,701
Norway	1,786,252	1,865,409	2,107,558
Denmark	1,937,898	2,160,231	2,427,367
Poland	322,216	236,431	479,247
Western Germany	2,749,334	2,924,480	3,978,917
Netherlands	3,586,693	4,572,656	4,726,151
Belgium	2,635,615	2,897,688	3,477,413
France	3,788,157	3,500,886	5,147,772
Switzerland	1,381,492	1,555,649	1,730,128
Portugal	941,859	1,153,264	1,420,753
Italy	3,080,298	4,293,432	4,861,214
Turkey	630,012	853,832	498,037
Netherlands Antilles	1,616,170	1,347,093	1,806,346
Egypt	1,754,456	2,170,847	6,145
Iraq	1,097,836	1,323,109	1,457,876
Indonesia	1,620,242	1,551,052	1,527,610
China	1,133,449	426,725	1,114,457
Japan	560,847	889,167	1,366,773
United States of America	3,621,426	4,245,917	3,746,418
Argentine Republic	2,767,733	1,472,814	2,491,002
Other foreign countries	1,154,596	1,647,265	2,148,453
Total	110,884,414	121,923,596	136,872,748

Glassware Catalogue

QVF Ltd., Fenton, Staffs, have published a new catalogue of their range of industrial plant in glass. In 130 pages, with 137 photographs, the catalogue details a range of basic interchangeable chemical plant units in regular production. They include pipeline and fractionating columns in diameters up to 18 inches, spherical vessels in capacities up to 200 litres and individual heat exchanger units in surface areas up to 60 square feet. All equipment listed is manufactured with buttress ends and couplings to British Standard specification 2598:1955.

Aromatic Chemicals Listed

A. Boake, Roberts and Co., Carpenters Road, London E15, have produced a new catalogue of their range of aromatic, pure perfumery and miscellaneous fine chemicals. The catalogue should interest compounders of perfumes and flavouring essences, the creative perfumer and cosmetic and pharmaceutical manufacturers.

Linear Measurement

The latest issue of the *Mobil Industrial Review* contains two articles on linear measurement. The first is a history of measurement, from the cubit (the length from the tip of the middle finger to the elbow) of ancient Egypt to the micro-inch of today. The second article deals in more detail with modern methods of measurement throughout the world. The *Review* is published by Mobil Oil Co., Caxton House, Tothill Street, London SW1.

Booklet on Tar

A revised edition of 'Dense Tar Surfacing', the booklet of the British Road Tar Association, 9 Harley Street, London W1, has just been published. The booklet covers the materials, composition, sampling, manufacture, transportation and laying of tar road materials.

Control of Flame Characteristics

The industrial gas development committee of the Gas Council have published a paper on the control of flame characteristics. The paper, which is distributed by the SIGMA Instrument Co., Letchworth, is intended to assist engineers engaged in furnace work and bright annealing, the processing of glass, and with installations where a constant air-gas ratio is required. Of particular interest were the results obtained from investigations into the problem of variation in flame characteristics in the manufacture of electric lamps. Two alternative control installations have been tested; the footmaking machine which seals the supporting wires into their glass holder and the sealing machine which seals off the base of the completed lamp. It was found that both flame characteristics control and Wobbe index control give equivalent results in performance of the footmaking machine but that Wobbe index control gives much better results on the sealing machine.

Plastics Laboratory Apparatus

J. W. Towers and Co., of Victoria House, Widnes, have published a new catalogue devoted exclusively to plastics laboratory apparatus. They list a wide range of apparatus in polythene, p.v.c., Perspex and p.t.f.e., including pipettes, jugs, test tubes and hydrometer jars.

Roof Linings

A leaflet describing 'Seel' incombustible roof linings has been produced by Chancery Insulations Ltd., 93 Chancery Lane, London WC2. 'Seel' linings consist of selected grades of asbestos fibre and are applied through spray apparatus to the underside of any type of industrial roof, insulating the building without adding to the fire risk.

Plastics Exhaust Tubing

Solid p.v.c. exhaust ducts, bends, tee pieces, offset pieces, weather caps and weather vanes are listed in a bulletin issued by Horwitch Smith and Co., Pensnett, Staffordshire. Their Oxythene tubing is available in diameters from 4 to 20 in.

Advantages of Mobil Heat Transfer Medium

Properties of Mobiltherm 600 as a heat transfer medium are discussed in the May issue of *Industrial Technical Bulletin*, published by Mobil Oil Co. Ltd., Caxton House, London SW1.

Any commercially successful heat transfer medium must possess the following properties:

(*a*) *It must be fluid.*
(*b*) *It must possess a high heat capacity.*
(*c*) *It must be economical.*
(*d*) *It must have a long service life.*
(*e*) *It must be easily available.*

The main materials which meet the above requirements and have found some use in industry include steam, water, mercury, molten salts and conventional mineral oils.

The advantages and disadvantages of all these materials are discussed. Fundamentally steam is excellent but for temperatures above 100°C. it is necessary to use high pressure piping and equipment. In addition there is the danger of rust and scale formation.

Mercury is expensive and presents certain toxicity hazards. Molten salts are widely used in high temperature systems but suffer from the disadvantage that once they solidify it is impossible to remelt them in those parts of the system not adjacent to the heat source.

To meet the requirement for an oil having a high resistance to thermal cracking, Mobiltherm 600 was developed. The makers claim that this oil possesses advantages over other mineral oils. It is composed almost entirely of aromatic hydrocarbons which are extremely resistant to cracking. Consequently there is little change in the flash point even after years of operation.

Switch Catalogue

A catalogue of switches and signal lamps has been issued by Arcolectric Switches Ltd., West Molesey, Surrey. A wide range of switches is listed, including micro-gap toggle switches, rotary switches, and a sensitive snap action switch.

Transducers

Specification sheets covering a number of transducers, the associate power units, and the Simple analogue computor have now been produced by Evershed and Vignoles Ltd., Acton Lane Works, London W4. The transducers covered are for flow, pressure, differential pressure and level. Further specification sheets are in course of production.

New Electronics Range

Shandon Scientific Co. Ltd., 6 Cromwell Place, London SW7, who set up a separate electronics department nearly two years ago have a number of new developments under way, such as potentiostats, coulometers, etc. This is mentioned in the Shandon *News Letter*, No. 7. This issue reviews the company's new Reichert-Shandon remote control microscope for nuclear metallography, type 722 ultra-rapid precision balance, type 180 automatic micro balance, Kawerau circular chromatography apparatus.

Synthetic Rubber Solves Hypochlorite Problem

AN AMERICAN firm of bleach manufacturers have solved a contamination problem by using synthetic rubber hose in their processing vats. The firm, the John Wiley Jones Co., manufacture bleach by reacting chlorine with caustic soda to produce sodium hypochlorite.

The process is carried out in vats made of concrete to withstand the strongly oxidising conditions. Chlorine is injected below the surface of a caustic soda solution and converts the sodium hydroxide to sodium hypochlorite. As the reaction progresses the contents of the vat are continuously recirculated by an outside pump and hoseline.

The company found that it had to replace its natural rubber hose every few months, as black material, shredded from the hose by chemical attack, was contaminating the solution. In May 1954, they fitted hose made of Hypalon, the synthetic elastomer produced by E. I. du Pont de Nemours, and they have used it continuously ever since without maintenance and without needing to replace any of it.

PEOPLE in the news

● Three fellowships for postgraduate research have been awarded by the British Oxygen Co. They go to MR. J. W. ARNOLD, London University, for research in the department of chemical engineering, Imperial College; MR. R. K. MACCRONE, University of Witwatersrand, Johannesburg, for research at the Clarendon Laboratory, Oxford; and MR. J. B. THOMPSON, London University, for research in the department of physics, University College, London. Renewal of fellowship for a third year has been granted to MR. R. A. H. POOL to continue research in the inorganic chemistry laboratory, University of Oxford.

● MR. GEORGE MARTIN has been appointed Midlands representative of Joseph Crosfield and Son Ltd. in succession to MR. JOHN HEWITT who has taken up a post in the sales control side.

● MR. ROBERT J. CARTER, district manager of Stone and Webster Engineering Corporation in Houston, Texas, has been appointed a special assistant to the managing director of E. B. Badger and Sons Ltd. of London, a subsidiary of Stone and Webster in Great Britain. Mr. Carter is familiar with British operations of the firm through his previous work in Britain. In 1949 and 1950 he was associated in the process and design engineering for the British Petroleum Chemicals project at Grangemouth, Scotland.

● New chairman of British Chrome and Chemicals (Holdings) is MR. M. J. C. HUTTON-WILSON. His appointment follows the death of Mr. E. E. Wright. Mr. Hutton-Wilson was previously deputy chairman and a managing director of the company. MR. A. C. J. BURNINGHAM, deputy managing director, has been appointed a managing director.

A new managing director, MR. A. HENDERSON, formerly a partner in Peat, Marwick, Mitchell and Co., will join the board on 1 January next. He will be responsible for financial matters.

V. Norman Luke, who as stated last week is the new manager of Partington Research Laboratory of Petrochemicals Ltd.

● SIR LAURENCE P. B. MERRIAM has been appointed chairman of British Xylonite Ltd., Highams Park, Essex.

● MR. A. P. T. HOLDEN, manager of Courtaulds, Ltd., Bull Royd Mills, Bradford, returned to this country on the *America* last week after a five-week business visit to the US and Canada, the main purpose of which had been the exchange of technical information. On his return, Mr. Holden said that his trip might help to develop here the newer synthetic fibres, particularly the acrylic fibres.

● Two young executives of the Reed Paper Group have just returned to this country after taking courses in paper and packaging at universities in the US. 26-year-old MR. ALFRED BARKER, has become the first person in the world to hold a Master of Science degree in packaging technology, after two years at Michigan State University. MR. GRAHAM HYLAND, who is 34, was the first British chemist to take an education course at the Appleton Institute of Paper Chemistry, Wisconsin.

G. Hyland

● MR. E. S. HISCOCKS, M.Sc., F.R.I.C., has been appointed director of the UK Scientific Mission in the British Commonwealth Scientific Office in Washington. He will also be attaché for scientific questions to the British Embassy. Mr. Hiscocks, who has been secretary of the National Physical Laboratory for the past 12 years, is expected to take up his appointment later in the year. He will succeed MR. H. J. HADOW, B.A., B.Sc., who has completed his term of office in Washington and will return to duty with the Department of Scientific and Industrial Research in England.

● MR. G. G. ROBERTS, M.Sc., formerly director of research to Smiths Aircraft Instruments Ltd., Cheltenham, has now been appointed technical director, succeeding MR. E. B. MOSS. Mr. Roberts becomes responsible for all engineering and development work at Smiths, Cheltenham, and the subsidiary company, Waymouth Gauges and Instruments Ltd.

● At the annual general meeting of the Institute of Physics held in Oxford on 16 July the following new officers were elected to fill the vacancies which will arise on 30 September: *Vice-president*, PROFESSOR E. C. STONER; ordinary members of the board, MR. F. OLDHAM and DR. J. THEWLIS. MR. O. W. HUMPHREYS (*president*), DR. J. TAYLOR (*hon. treasurer*) and PROFESSOR F. A. VICK (*hon. secretary*) were re-elected.

● MR. A. W. EDWARD, president of Morganite Inc. of the US, has been appointed a director of the Morgan Crucible Co. Ltd.

● MR. S. M TIKHOMIROV, USSR Minister of Chemical Industry, who last week visited the Wilton Works of Imperial Chemical Industries Ltd. has been seeing chemical and plastics plants in this country since the close of the recent British Plastics Exhibition.

● The representative of the Northern Aluminium Co. Ltd. on the council of the Aluminium Development Association is to be MR. S. E. CLOTWORTHY, managing director of Northern Aluminium. He replaces MR. W. FRASER BRUCE, who is now president of the Aluminium Company of Canada. MR. B. L. PAGE (a director of John Dale Ltd.) has succeeded MR. J. F. PAIGE as the representative of the aluminium founders' organisation, LMFA Development Ltd. MR. R. T. RAVEN (works director of Birmetals Ltd.) and MR. DESMOND JAMES (TI Aluminium Ltd.) have joined the executive committee.

● Board changes in subsidiary companies of the United Glass Bottle Manufacturers have been announced. MR. P. JONES, a director of the parent company, has been appointed a director of Dilworth and Carr and has relinquished his appointment on the board of Kork-N-Seal. MR. A. DUMVILLE has been appointed managing director of Kork-N-Seal and MR. I. P. H. MACAULAY has been made a director of the same company.

Dr. H. G. Reid-general manager of the new £100 million ICI Severn-side project [reported in CHEMICAL AGE, 6 July, p. 17].

● LIEUT.-COL. V. I. ROBINS, O.B.E., A.C.A., has been appointed director of the National Union of Manufacturers in succession to MR. C. F. V. WILLIAMS who retired recently.

● MR. JOHN H. RAMSAY, managing director of T. and H. Smith, chemical and pharmaceutical manufacturers, and chairman of Duncan Flockhart and Co., pharmaceutical manufacturers, has now retired from active business life.

In Parliament

NO REPRESENTATIONS RECEIVED ABOUT UNIVERSITY GRANTS

THE Chancellor of the Exchequer has received no representations about the insufficiency of the allocations made by the University Grants Committee for the quinquennium beginning on August 1 this year. This was stated by Mr. J. E. Powell, Parliamentary Secretary to the Treasury, last week. He was also asked if he was aware that all the universities were disturbed by these allocations and by the fact that the allocation to each faculty was also designated and in that, in some cases, sufficient emphasis was not placed by some universities on the need for expanding technological education.

Mr. Powell replied: 'These are misconceptions. The recurrent grant is not limited to subjects, but it is a block grant to the universities concerned. The Chancellor and, I think, the University Grants Committee have received no representations as regards the distribution between universities.'

Customs Duty on Sulphate of Ammonia

If an application for the removal of the Customs Duty on imported sulphate of ammonia was made by the users, Sir David Eccles, President of the Board of Trade, would consider it. Sir David stated this in the House last week in response to a request to withdraw the duty. He was further asked if he was aware that sulphate of ammonia was marketed by a 'very tight monopoly' and that there was no reflection in this country of the sharp falling of prices in the US and Europe. Sir David said that the figures did not bear that out. UK production was running at about 1 million tons a year and imports in the first five months of this year totalled 50 tons.

New £7m. Particle Accelerator Planned

Proposals for the construction of a new particle accelerator which will be one of the largest atom-smashing machines in the world when completed, have been examined by the National Institute for Research into Nuclear Science. This was stated by the Prime Minister in a written reply on Tuesday.

The design for this machine, a 7,000 million electron volt proton synchroton has now been agreed and work on its construction has been put in hand. Cost of the machine is estimated at about £7 million. It will be built on a site to be made available by the UK Atomic Energy Authority. Stated to be of unusual and exceptionally efficient design, it will involve the construction of a magnet in the form of a ring 120 feet in diameter, which will weigh 6,000 tons.

Market Reports

SPOT DEMAND REMAINS GOOD

LONDON There have been no outstanding features during the past week, and the spot demand in most sections of the market remains reasonably good despite the restrictive effect of the holiday period. Contract deliveries to the home consuming ndustries are also on a reduced scale. Prices for the most part are unchanged and the undertone generally is firm. The basis price for white lead is higher by £2 at £130 10s per ton, and red lead is up by 50s per ton at £122 10s per ton. The revised prices operate from 26 July. A fair business is being done in the coal tar products market and the position is unchanged and firm.

MANCHESTER Pretty well all sections of the Manchester chemical market continue on a strong price basis. Contract deliveries are affected by holiday stoppages at the consuming end, but due allowance being made for this factor there is a steady demand for the alkalis and other leading products. Shipping enquiry is fairly active. Some sections of the fertiliser trade are reasonably busy, including basic slag and the concentrated fertilisers.

GLASGOW Little or no change in the Scottish heavy chemical market has taken place during the past week. Business generally still remains quiet, as was to be expected with the ensuing holiday period. However, with the resumption next week, a return to normal conditions is anticipated. On the whole, prices have been firming with still some increases being reported. A rather better week's trading has taken place in agricultural chemicals, while export still shows considerable activity.

Obituary

MR. L. K. BRINDLEY, consultant to the president of the International Nickel Co. of Canada Ltd., on 29 July. At his retirement last February Mr. Brindley was deputy chairman of the Mond Nickel Co. Ltd., which he joined in 1948, following his resignation from the presidency of the Falconbridge Nickel Co. Ltd.

Changes in Export Control of Selenium

CERTAIN changes in export licensing control have been announced by the Board of Trade, and came into force on August 1. These are as follows: (a) Licences will no longer be required to export some forms of selenium, ferro-phosphorus and ferro-silicon. (b) Due to changes in the list of goods controlled for strategic reasons, agreed in consultation with those countries which operate similar controls, licences will be required for the export to all destinations, other than the Commonwealth, the Irish Republic and the US, of certain types of centrifugal testing apparatus and specified forms of polytetrafluoroethylene and polytrifluorochloroethylene. The order relating to this change is the Strategic Goods (Control) (Amendment No. 4) Order 1957 (SI.1957 No. 1282, price 3d., by post 5d.) and Transhipment Open General Licence Amendment dated July 22 (price 3d., by post 5d.). Copies of these orders and licences are obtainable at H. M. Stationery Office, Kingsway, London WC2, and branches.

TRADE NOTES

Imports of synthetic rubber into the UK in 1958 have been authorised by the Board of Trade up to the level of 80,000 tons, of which 60,000 tons will consist of GR-S general purpose rubber and the remainder of various special purpose types. These figures are the same as those in the programme for the current year.

Oil Firm Changes

The world distribution of Amber Oils Ltd. pressurised dispenser products, Aerozene penetrating oil and spring lubricant, Blink invisible metal protector, and Rusolvent easing fluid, has now been taken over by Slip Products and Engineering Co. Ltd., of 34 Great St. Helen's, London EC3, and St. Albans. Ambersil silicone mould release and anti-stick agent and Ruby industrial protective lacquer will continue to be handled by Amber Oils Ltd.

Factory Re-equipped

Horwitch Smith and Co. Ltd. have re-equipped their old premises at 42 Lower Loveday Street, Birmingham 19, and concentrated there the whole of the manufacture of p.v.c. paste and the grinding and colouring of polythene, nylon, Perspex and epoxide resins. This newly equipped works is now equipped to give demonstrations of the Knapsack-Griesheim whirl sinter equipment, the flame spraying of all types of polymers, the spraying of p.v.c. spraysols and the dip application of p.v.c. plastisols and plexigel.

Plastics Machinery

F. J. Edwards Ltd., manufacturers of sheet metal working machines and machine tools, 359 Euston Road, London NW1, have set up a new division to handle a comprehensive range of machinery for the plastics industry.

Commercial News

British Tar Seek to Offset Falling Supply of Crude Tar

FINANCIAL results for British Tar Products Ltd., for the year ended March 31, were described by the company's chairman, Mr. F. Woolley-Hart, as distinctly satisfactory. In spite of capital expenditure of £52,720, net current assets were little changed at £228,495 and, said the chairman, clearly demonstrated the strength of the liquid position to finance not inconsiderable plant extensions, which might become necessary due to extending trade, in the near future.

Trading profits expanded from £87,298 to £106,598 in 1956-57 and as has been announced a 5 per cent. tax free capital bonus plus 25 per cent., less tax, dividend is payable. In order to reduce disparity between interim and final dividends, the directors are proposing to increase the rate of the interim dividend next January.

Constructional work on the company's oil storage installation has progressed. To offset the effects of a declining supply of crude tar, increased purchases of semi-refined chemicals have been made. It is hoped that the company may be able to continue to do this on a larger scale as its traditional raw material finally ceases. In addition to the orthodox tar and benzole derivatives, owing to the company's ability to comply with the highest specifications, it is continually extending the range of products to meet the increasing demands of the plastics and other industries. Recent progress in this field has been encouraging, the chairman reports.

Anchor Chemical Co. Ltd.

An interim dividend of 5 per cent (same) has been recommended by Anchor Chemical Co. Ltd. Date of payment will be 13 August.

The APV Co. Ltd.

Although turnover was more or less maintained in 1956 by The APV Co. Ltd., the difficult conditions the company operated under interfered with smooth production. This with rising costs and falling profit margins resulted in a smaller profit than was earned in 1955. This was reported by Dr. R. J. S. Seligman, chairman, at the annual meeting last week.

During its first year the chemical engineering division secured work in connection with the erection of complete process plants which was in excess of that obtained by the company in previous years. Dr. Seligman mentioned a 'notable order for a naphthalene distillation plant'.

Benn Brothers

Final dividend of 10 per cent on ordinary, making 15 per cent for the year ended 30 June, is recommended by Benn Brothers Ltd., proprietors of CHEMICAL AGE. A final of 3 per cent is proposed on preference, making 6 per cent for the year.

Griffiths Hughes

Consolidated profit of Griffiths Hughes Proprietaries Ltd. for the year ended 31 March, before tax of £267,996 (£208,753), was £465,659 (£388,573). A dividend of 7½ per cent (same) is proposed on ordinary and £7,634 is carried forward.

George Kent

Industrial instrument makers, George Kent, are raising the ordinary distribution from 15 per cent to 17½ per cent for the year ended March 31, 1957, by the addition of a 2½ per cent bonus to the unchanged 12 per cent final dividend.

The parent company's profit, after tax, is £204,160, against £189,568, and the group profit £160,946 (£161,423).

Of the group's three main divisions, those concerned with mechanical water meters and instruments of control and measurement are stated to have done well.

Monckton Coke and Chemical

A final dividend for the year ended 30 June 1957 has been declared for Monckton Coke and Chemical. This is 1s 4d per 1s share, making 2s per share, less tax (same) and a distribution of 2s (1s) per share from accumulated surplus on realisations of capital assets. It is emphasised by the directors that special distributions are to be regarded as exceptional and not as an annual event. Net profit of the company subject to audit is £71,863 (£60,204) after tax of £88,862 (£69,105).

Thomas De La Rue

The effect of an agreement between American Cyanamid Company and Thomas De La Rue and Co. Ltd. was described by Mr. B. C. Westall, chairman, at the annual meeting last week. A new company, Formica Ltd., is being formed in this country. The agreement provides, for a period of 25 years, for full and complete exchange of technical information in the field of laminated plastics. Mr. Westall said 'Knowing something of the huge sums which American Cyanamid Co. spend annually on research and development, I feel certain that this feature of the arrangement will be of very material value in the years to come.'

NEW COMPANIES

CEM LTD. Cap. £1,000. To carry on the business of merchants, agents and manufacturers of and dealers in all kinds of chemicals, waxes, powders, etc. First directors are: Lothar N. Hocking, Victo. M. Ormerod, and John Aherne-Heron. Reg. office: 27 Millbank, London SW1.

CHLORINATION EQUIPMENT LTD. Cap. £25,000. Manufacturers of and dealers in water chlorination equipment, etc. Directors: O. C. Kerrison and M. C. Coleman (appointed by Fisher and Porter Co., Hatboro, Penn., US), A. C. Harvey, R. W. Aitken and L. H. Aricson. Solicitors: Theodore Goddard and Co., 5 New Court, London WC2.

DUNHAM CHEMICAL LTD. Cap. £100. Manufacturers of and wholesale and retail dealers in chemicals, gases, detergents and disinfectants, etc. Directors: R. T. Arnold, and E. K. Baker. Reg. office: 34 Victoria Street, London SW1.

KOLENE (GB) LTD. Cap. £100. To acquire, work and develop concession rights under technical processings disclosed by Kolene Corpn. of Detroit, Michigan, US, and in particular concession rights in the UK, for supplies to the full field of engineering trades of Kolene chemical processes and equipment. Solicitors: Linklaters and Paines, 59-67 Gresham Street, London EC2.

Balfour to Build Tower Box Purifier at Worcester

A £135,000 tower box purifier is to be installed at the Worcester Gas Works for the West Midlands Gas Board by Henry Balfour and Co. Ltd., Leven, Fife.

The tower box design consists of a large welded steel container sub-divided into five towers. In each tower there are six trays holding oxide to remove sulphur impurities from the entering gas. This enters each tower through large connecting mains, passes through the oxide and is purified.

Initially the plant will have a total oxide capacity of 28,400 cu. ft., and the gas throughput will be 4 million cu. ft. a day. Eventually it is hoped to double this throughput by adding six further oxide-holding trays to the east tower.

Work is due to begin at the end of this year and is scheduled to be completed by the end of 1958.

NEW PATENTS

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